Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS

Founded 1896

Chicago, April 28, 1928 (Issued Every Other Week) Volume XXXI, No. 9

MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

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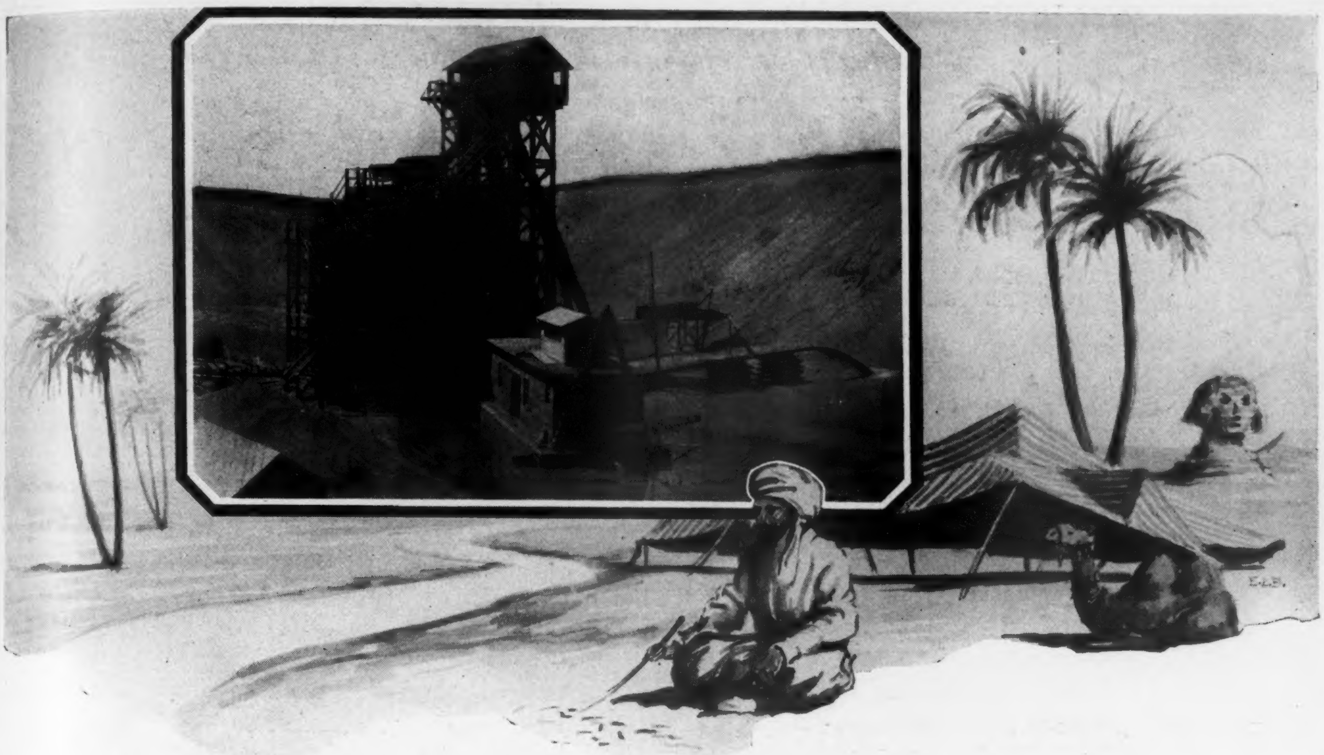

Written in sand

TO THE Arabian nothing is more unstable than the ocean of shifting sand surrounding him. Never for two days is the desert's sandy surface the same. A name written in sand!—an Arab can say nothing worse of any man's stability than that. But with all their centuries of wisdom what do they know about sand as we use it in America?

There's a sand and gravel pit behind every modern building, every concrete road,—there's a place for sand in every step we take along the path of public progress.

Link-Belt equipment for sand and gravel excavating, washing, grading and handling is foremost in the field.

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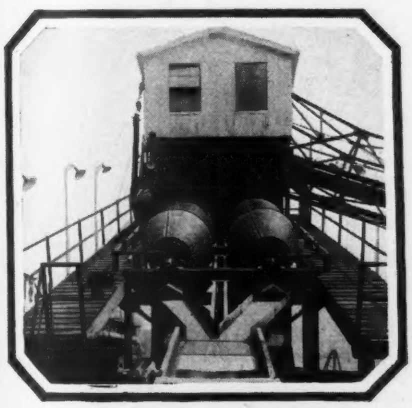

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Sand and Gravel Washing Plants

The Only Paid Circulation Covering the Rock Products Industry

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Founded 1896

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A Prest-O-Weld outfit for oxy-acetylene welding and cutting doesn't pay interest. It pays principal. It pays back your expenditure and then keeps right on making a profit for you.

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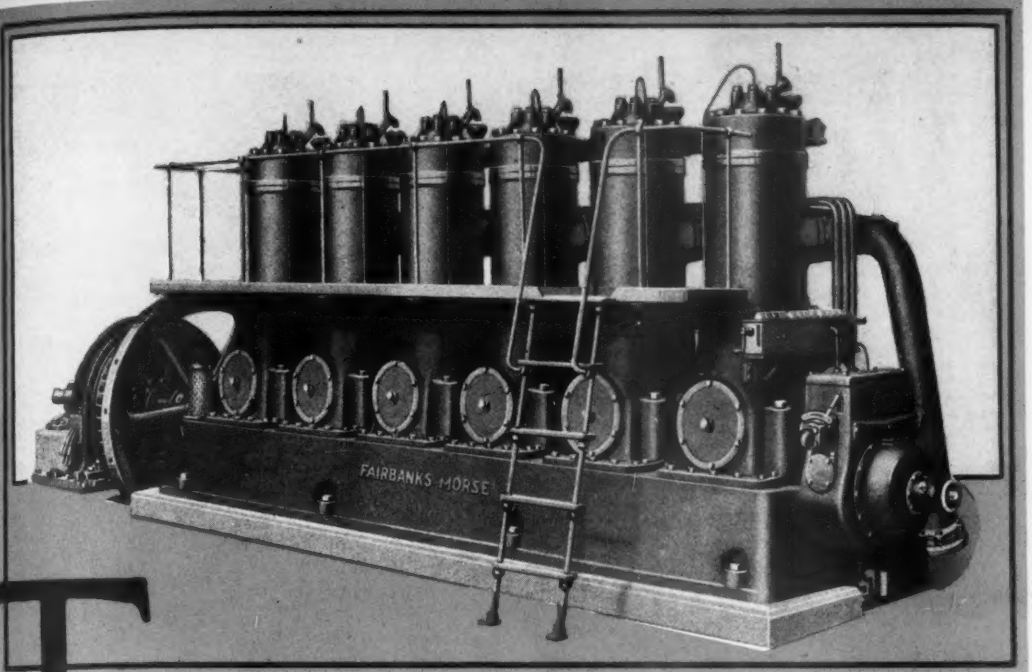
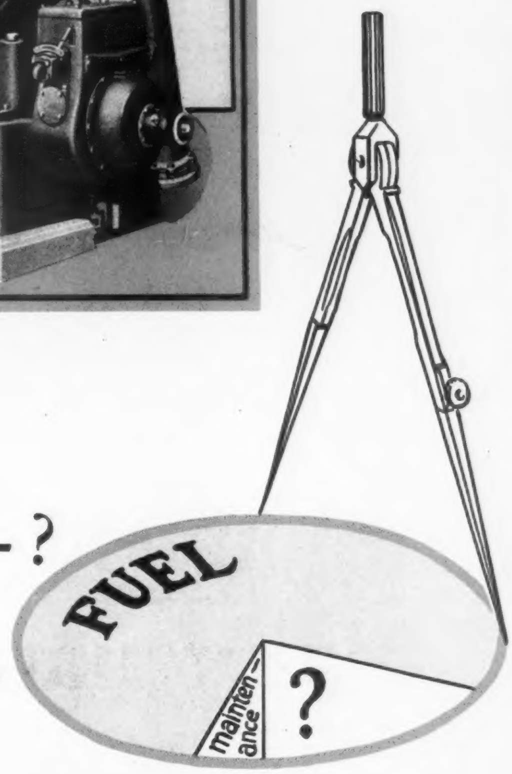


The true test of DIESEL Economy - - - ?



ON a five day test run one Diesel will show about the same *fuel* economy as another—but—if the test were continued over a five year period—what a difference!

Fuel economy cannot be accurately determined in a short period. Nor is fuel economy in itself a true test of Diesel economy. It takes years of service to determine the true standard, to bring out other factors which have an important bearing on Diesel power costs.

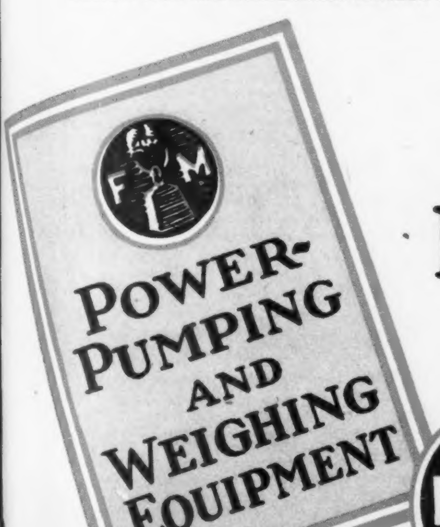
Short test runs are made under ideal conditions—when an engine is at its best. It takes years of service to determine *average* fuel consumption and to bring out the difference in labor and maintenance costs.

The Fairbanks-Morse Diesel in a test of years shows to advantage its features which give greater over-all economy — both *fuel* and maintenance. For the Fairbanks-Morse two cycle, airless injection engine maintains a flat fuel consumption curve — it has no fuel or exhaust valves to set or grind and *no drop in efficiency between grinding periods.* No delicate parts—no complicated auxiliaries to require constant care and maintenance—the F-M Diesel is Diesel efficiency in its simplest form.

As a result, the Fairbanks-Morse Diesel gives *continuous* fuel economy and requires a remarkable minimum of replacements and servicing. These economies are a proved fact—written into the operating records of more than a million and a half horsepower of Fairbanks-Morse Diesels.

There is a difference between *actual* economy and *theoretical* economy. Think of it when you specify the Diesel for your service.

1,500,000 hp. have proved these facts



FAIRBANKS-MORSE

DIESEL ENGINES

FAIRBANKS-MORSE DIESEL ENGINES

A "Crushing" Victory for Haynes Stellite

Top and side views of a Stellited hammer. The white surface is the layer of Haynes Stellite.

HAYNES STELLITE was matched with manganese steel as a wearing surface on the hammers in a No. 8 Jumbo Williams hammer mill for pulverizing coal through a 1/8" screen.

Here's what happened. While the Stellited parts cost twice as much as the steel parts, they lasted four times longer. In fact, the Stellited hammers ran for 45 days, crushing 1300 tons per day.

A clean-cut victory! Yet this is the kind of victory Haynes Stellite is winning every day. As an abrasion-resisting metal, it has no equal.

You can apply Haynes Stellite to wearing parts right in your shop. Simply flow a layer of the molten metal over the heated surface of the wearing part with the oxy-acetylene flame, using an excess of acetylene.

Our booklet, "Haynes Stellite in Cement Mills," explains the Stelliting process in detail, and suggests many places where it can be used. We shall be pleased to send it to you.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

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The Carbic Light is portable. The popular No. 2 model weighs only 115 pounds fully charged. Two men can carry it easily.

It's so simple in construction you can charge it in three minutes to burn for twelve hours. So sturdy it will give you many years of service. So economical it costs but 6 cents an hour to operate.

Thousands of Carbic Lights are in use on every sort of night construction job. For 14 years they have been helping contractors "keep up to schedule."

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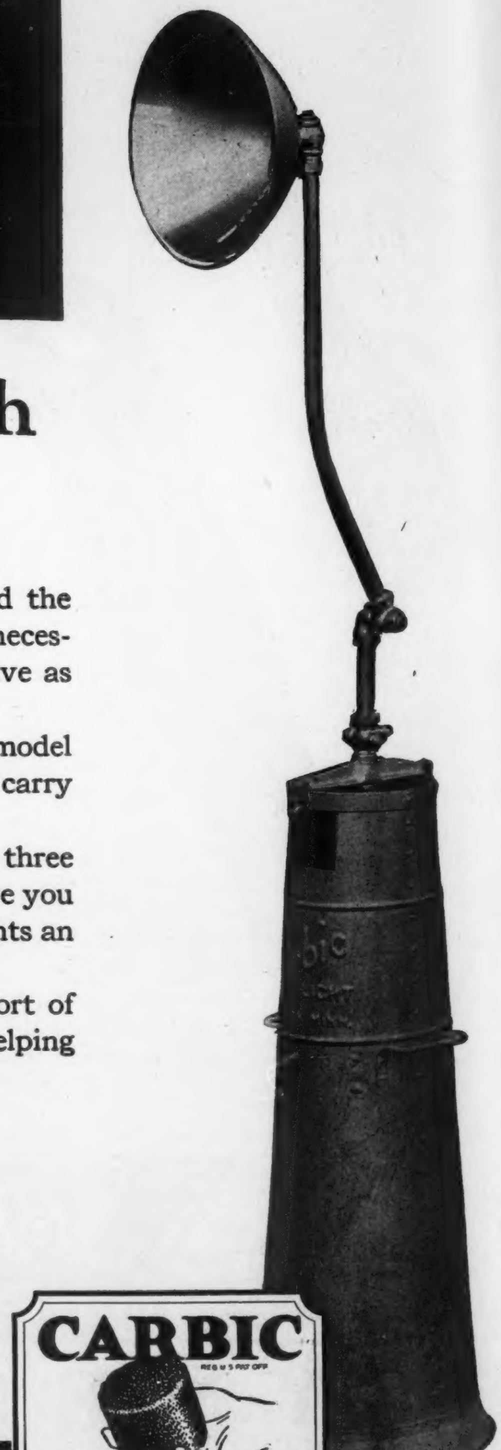
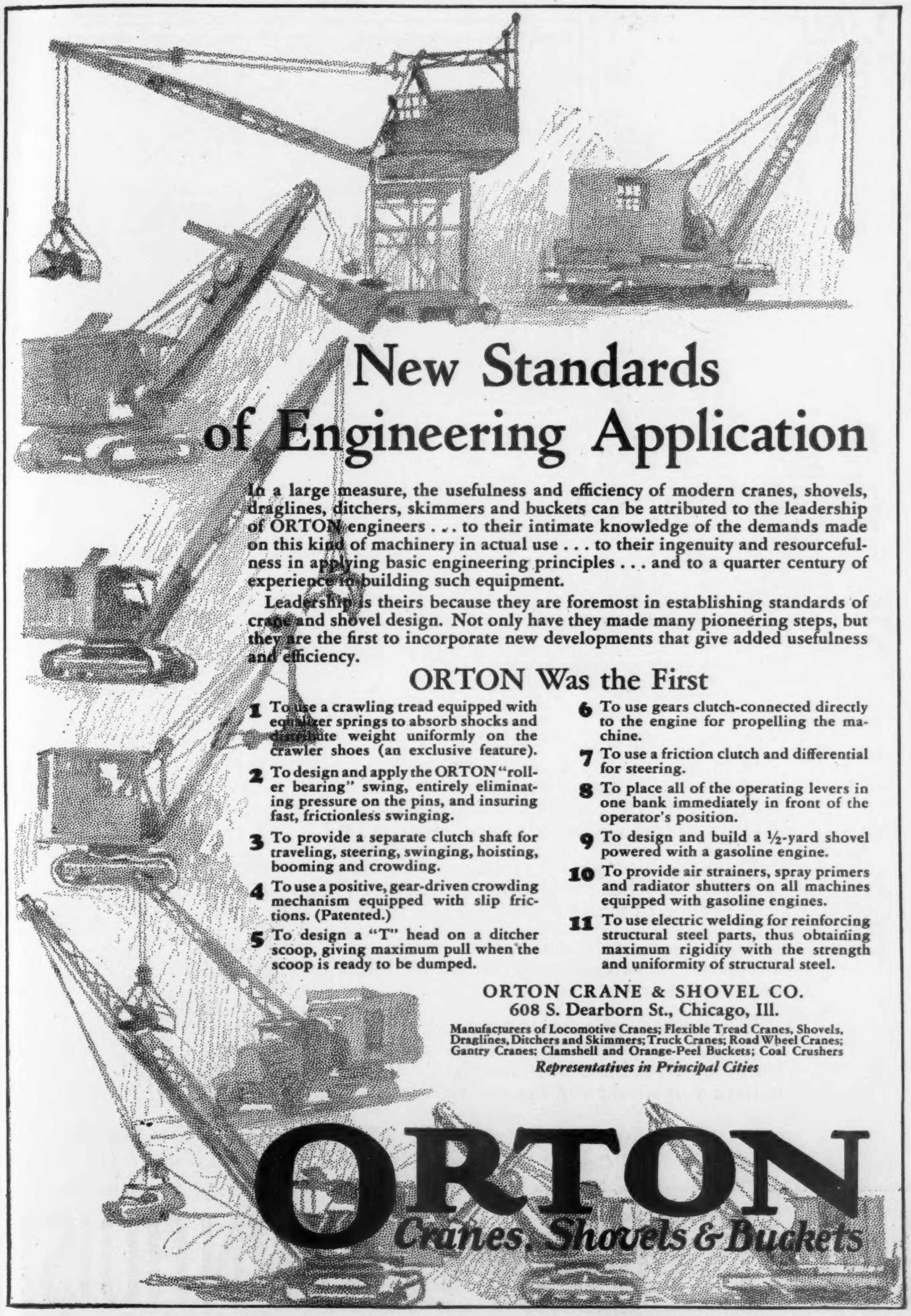


Style No. 2

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.


New Standards of Engineering Application
In a large measure, the usefulness and efficiency of modern cranes, shovels, draglines, ditchers, skimmers and buckets can be attributed to the leadership of ORTON engineers . . . to their intimate knowledge of the demands made on this kind of machinery in actual use . . . to their ingenuity and resourcefulness in applying basic engineering principles . . . and to a quarter century of experience in building such equipment.
Leadership is theirs because they are foremost in establishing standards of crane and shovel design. Not only have they made many pioneering steps, but they are the first to incorporate new developments that give added usefulness and efficiency.
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1 To use a crawling tread equipped with equalizer springs to absorb shocks and distribute weight uniformly on the crawler shoes (an exclusive feature).
2 To design and apply the ORTON "roller bearing" swing, entirely eliminating pressure on the pins, and insuring fast, frictionless swinging.
3 To provide a separate clutch shaft for traveling, steering, swinging, hoisting, booming and crowding.
4 To use a positive, gear-driven crowding mechanism equipped with slip frictions. (Patented.)
5 To design a "T" head on a ditcher scoop, giving maximum pull when the scoop is ready to be dumped.
6 To use gears clutch-connected directly to the engine for propelling the machine.
7 To use a friction clutch and differential for steering.
8 To place all of the operating levers in one bank immediately in front of the operator's position.
9 To design and build a ½-yard shovel powered with a gasoline engine.
10 To provide air strainers, spray primers and radiator shutters on all machines equipped with gasoline engines.
11 To use electric welding for reinforcing structural steel parts, thus obtaining maximum rigidity with the strength and uniformity of structural steel.
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ORTON
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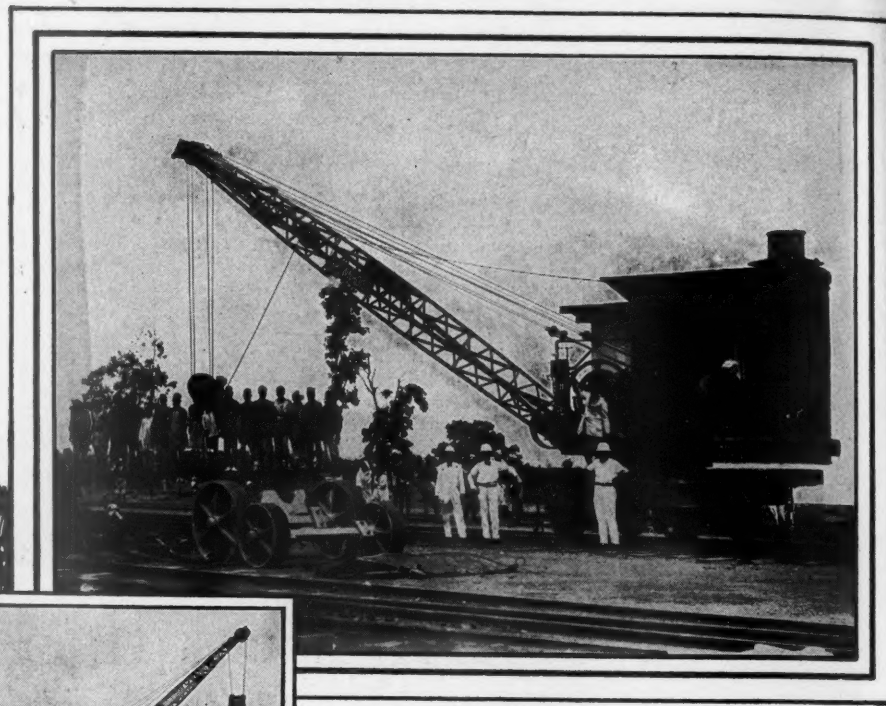

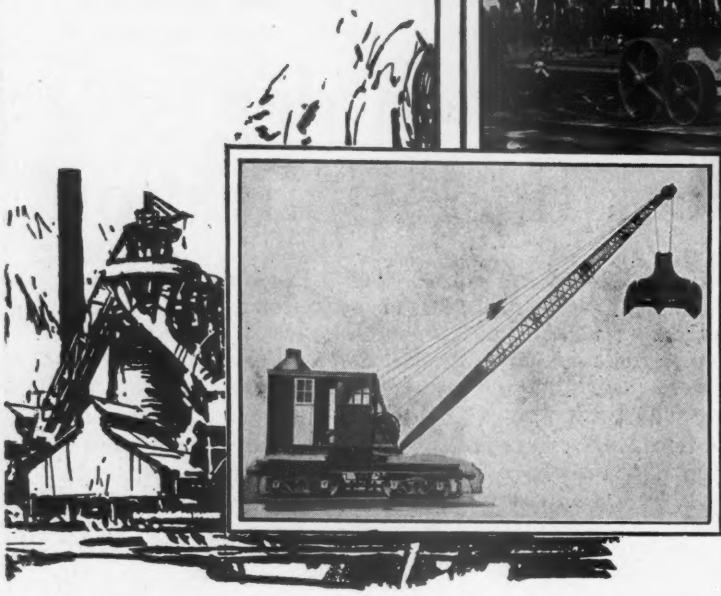

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Industrial Brownhoist Economy Wins Over Coolie Labor

If you could hire all the laborers you wanted at a per capita cost of a few cents a day, there might be some reason for not considering the use of an Industrial Brownhoist. Yet, in India, where this very condition exists, the Tata Iron & Steel Company have used these locomotive cranes since 1914.

People buy cranes only on a dollars and cents investment basis. And it is only because Industrial Brownhoists do give the lowest cost per ton of material handled that thousands are in use today.

Equally effective on bucket, hook, and magnet work, an Industrial Brownhoist will handle all kinds of materials and go anywhere to do it.

You undoubtedly know how much your materials handling is costing you at present. Why not compare this figure with what it would cost to have an Industrial Brownhoist do the work? We believe you would find the saving worth while. Let us prove it.

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General Offices: Cleveland, Ohio.

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PIONEERING IN BUCKET DESIGN

Ball Bearings are furnished in ¾ to 1 cu. yd. Dreadnaughts to reduce friction losses and gain maximum digging power from the line pull. Grease Sealed in with felt packing rings.

LONG ago Blaw-Knox pioneered those improvements in design so vital to successful bucket performance — one-piece cast head, heavy, forged one-piece corner bars, high carbon steel cutting lips, hardened steel pins and guide rollers, bushed and lubricated moving parts and NOW, to offset lubrication neglect, to give long life to a part which in all buckets requires frequent renewal, THE BALL BEARING SHEAVE. This new feature adds immeasurably to the life of the bucket, increases digging power and reduces friction losses to the minimum. It is sealed to keep grease in—to keep grit and sand out—it is found only in Dreadnaught Buckets.

Consider and compare before you buy buckets. The differences that spell long life or poor investment are not always obvious. Blaw-Knox Buckets are known by the customers that keep them and buy more—their name is legion.

The New Books for Intending Bucket Purchasers—Bulletin 1017, Dreadnaught Buckets, and Bulletin 1023, Dragline Buckets. Just ask our nearest District Office for your copies.

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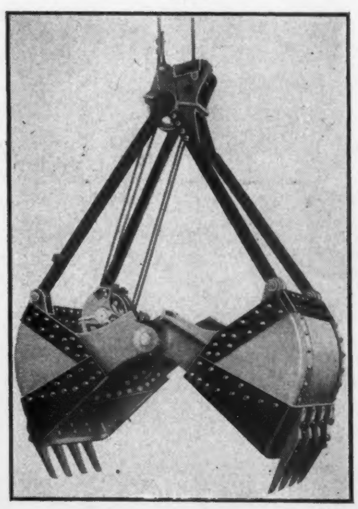
For the convenience of our customers and to insure prompt shipment of renewal parts, Blaw Knox now carry in stock a complete supply of parts for all Blaw-Knox Buckets now in service. You are insured against vexatious and expensive delays.



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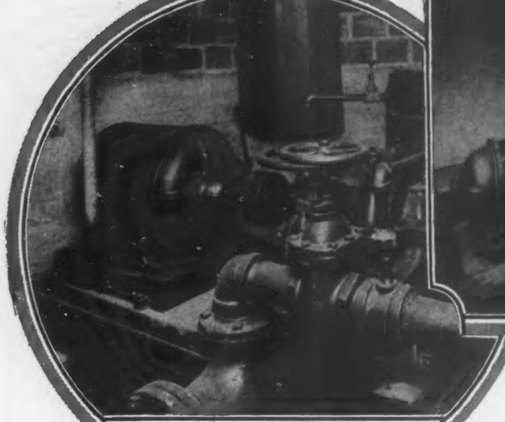
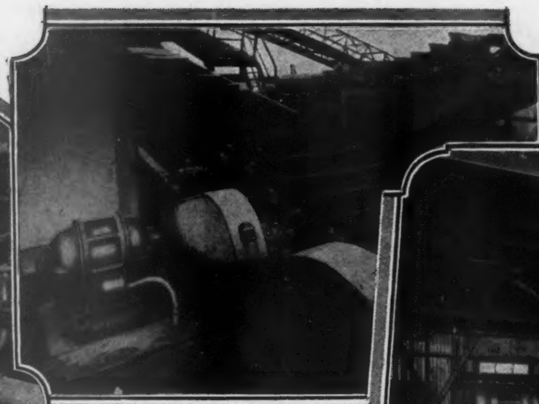
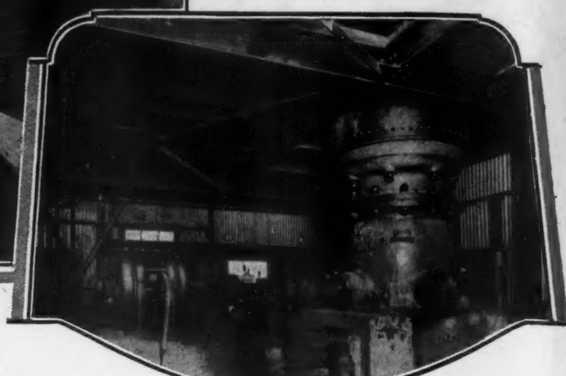


G-E 60-hp., 1435-r.p.m. motor direct-connected to centrifugal pump



10-hp., 720-r. p. m. G-E motor driving sand separator which handles approximately 200 tons per hour



G-E 25-hp., 480-r.p.m. motor direct-connected to gyratory crusher

15-hp., 720-r.p.m. G-E motor driving set of three conical screens which handle 220 tons per hour

Handling Sand and Gravel with G-E Equipment

In the sand and gravel industry—as in cement, stone, and brick plants—operators are depending more and more on G-E Motorized Power.

The plant of the Buffalo Gravel Corporation is unique. Raw material is dredged from the bottom of Lake Erie and conveyed in boats and barges to the plant. This unusual method of transporting the supply of sand and gravel, combined with stringent space limitations, gives rise to special problems in handling. G-E equipment has contributed greatly to their satisfactory solution.

The severe service of sand and gravel plants makes only the best of drive suitable. The vibration and varying loads of a crusher, the overloads of a conveyor, as well as adverse atmospheric conditions, demand motors of proved design, construction, and performance. G-E motors and control have an enviable reputation in the rock products industries.

G-E engineers have made an intensive study of sand and gravel plants; they can advise you concerning the difficulties you encounter. Your nearest G-E office will render any service you may require.

When you specify G-E Motorized Power, G-E rock products specialists study your electric drive problem, select from the complete G-E line the motor or motors best suited, choose the necessary control equipment, and then see that the installation is properly made and serviced. This complete service is available through your nearest G-E office.

Motorized Power

—fitted to every need

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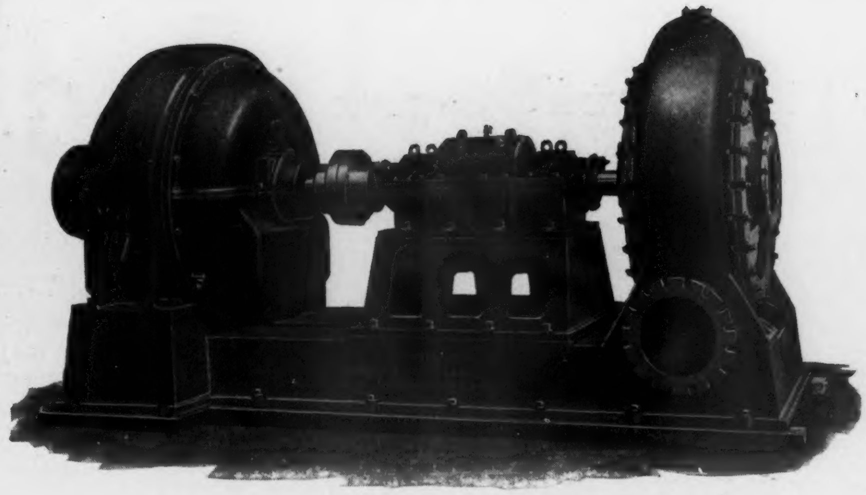

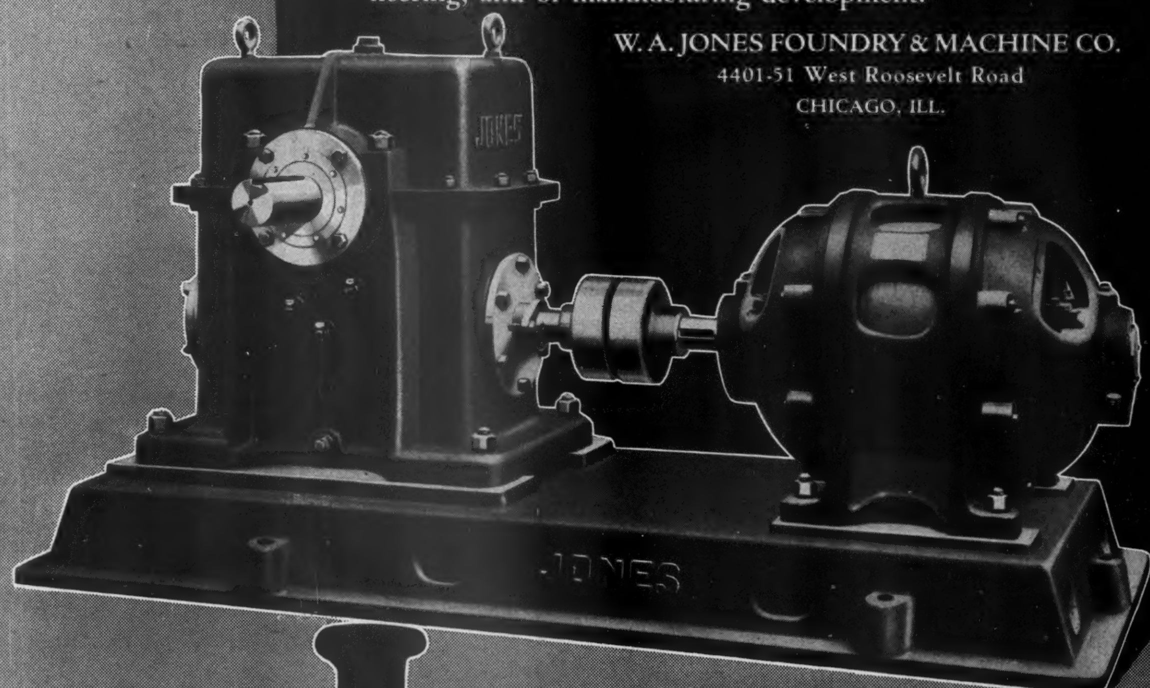
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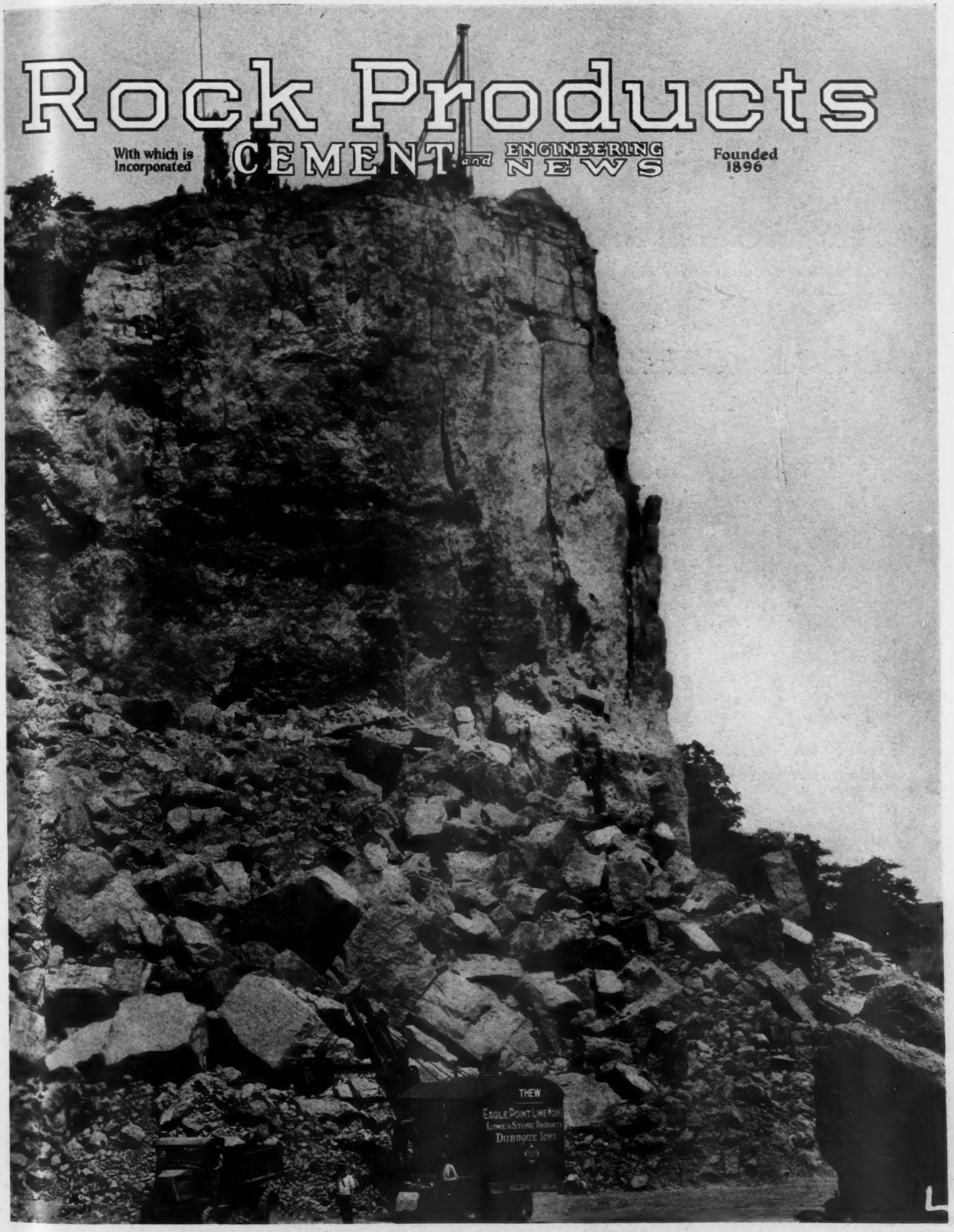
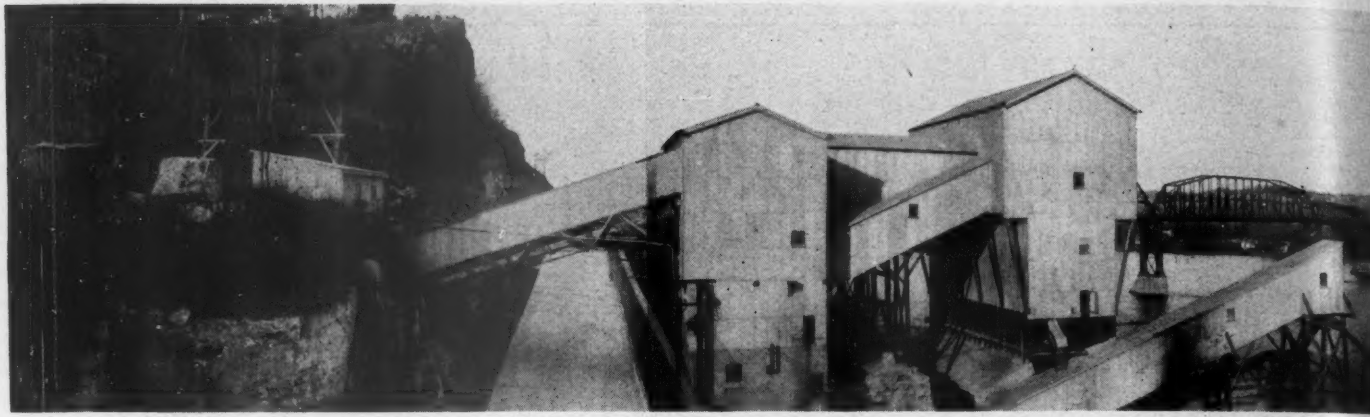
Volume XXXI Chicago, April 28, 1928 Number 9



Quarry face, about 150 ft. high at this point, of the Dubuque Stone Products Co. A smooth quarry floor, short haul, and a crusher below the quarry level provide the right conditions for truck transportation



General view of the plant of the Dubuque Stone Products Co. with the quarry at the left, and the Mississippi River showing at the right

Model Iowa Limestone Quarry and Crushing Plant

Dubuque Stone Products Company, Dubuque, Iowa, Operates a Quarry with 200-Ft. Face, Using a Complete Trucking Operation

ONE of the most recently completed crushed stone plants in the central west is that of the Dubuque Stone Products Co. at Dubuque, Iowa. This new plant, located on the site of a former plant, started operating during the summer of 1927, and it is now turning out 2000 tons of crushed stone daily. It is a good example of a logically developed and carefully planned layout, utilizinz a minimum amount of space to obtain a good sized output. Here compactness is an absolute necessity, since the plant is located within the limits of the city of Dubuque, and is bounded on two sides by residences, on the third by a large park and in front by the Mississippi river. (It might be remarked also that probably no other crushed stone plant has a scenic location to compare with that of the Dubuque plant, situated as it is part way up the bluff of Eagle Point, which juts out into the Mississippi here, affording a remarkable view of the river for miles to the north and south.)

The Dubuque company has developed a bluff quarry with a face of fully 200 ft. at its highest point. Naturally with this type of operation, the methods used will differ considerably from the usual quarry operations. Three factors have been chiefly instrumental in determining how the plant shall be operated—the extremely high quarry face, the proximity of residences, making care in blasting doubly necessary, and the location of the crushing plant entirely below the bottom of the quarry.

The property being developed is about 15 acres in extent, approximately one-third of which has already been opened up. The deposit is of excellent stone for ballast or aggregate, and is also used extensively for making lime. It is a dense, brownish dolomite, distinctly stratified, especially near the top, but forming a very hard and solid mass throughout. Some idea of the character of the stone can be obtained by noting that it has a specific gravity of 2.72, weighs 169 lb. per cu. ft. and has a coefficient of hardness of 15.2. The rock is covered with an overburden which averages about 4 ft. in thickness. Stripping is done with a Thew gasoline shovel equipped with a 1½-yd. bucket, and the earth is taken to ravines back of the quarry by truck.

Blasting Practice

Particular care is taken in the blasting due to the nearness to residences. All primary drilling is contracted. At the present time the company is trying out a Denver-Gardner derrick drill for this work, after considerable experimenting with a number of other types. With well drills 6-in holes were sunk to a depth slightly below the level of the quarry floor, the holes averaging 150 ft., or a little more, in depth. They were spaced 16 ft. apart, and were about 25 ft. back from the face of the quarry. Approximately 1000 lb. of 4x12-in. 50% du Pont gelatine dynamite was used in each hole. Five to 12 holes were shot at one time, but the usual shot was not more than six or seven holes. A recent blast of nine holes brought down 65,000 tons of rock. For secondary blasting, to bring the stone to a size that can be handled by the primary crusher, Denver rock drills are used with 1x8-in. du Pont dynamite.

In the quarry a No. 460 Marion electric shovel, equipped with a 1½-yd. bucket, is used. The electric shovel has proved to be successful for this work and has cut down the labor costs for operation, since it can be handled well by one man. It is noted that at this plant steam has been practically eliminated both in the quarry and in the operation of the crushing plant itself. The plant, completed within the past year, thus affords another example of the growing tendency for the use of electricity in place of the older steam power equipment.

A Complete Trucking Operation

The Dubuque company has developed the use of trucks in the quarry, as is thoroughly compatible with a layout where the opening of the primary crusher is practically on the level of the quarry floor. The movement of the trucks is easy and rapid, and the labor is much less than would be required for any other form of transportation. In fact, a leveled quarry floor is the only necessity for good operation, since no ramps are needed to reach the crusher. The company uses two Mack 7½-ton trucks, equipped with special bodies made by the Easton Car and Construction Co. Each truck will carry 500 to 700 tons of rock to the crusher in a 10-hour day, depending somewhat on the position of the shovel in the quarry. The haul runs from 200 to 500 ft. between the shovel and the crusher.

The trucks dump directly to the 30-in. Traylor primary gyratory crusher from an elevation of about 6 ft., the rock sliding down a 45 deg. incline into the crusher. A Chicago Pneumatic air hoist is hung over the crusher to be used for getting large pieces into the opening when necessary. The

Drilling at the edge of the quarry face, 200 ft. above the quarry floor

crusher is driven by a 150-hp. General Electric motor. The discharge from the primary crusher passes to a 30-in. Stephens-Adamson conveyor which carries it to the scalping screen. This conveyor is of 76-ft. centers and is fully enclosed, a necessary precaution, since it passes directly over a well traveled concrete road. A 15-hp. General Electric motor drives the conveyor.

Plant Layout

At this point it would be well to study the general layout of the Dubuque plant more closely to understand better the way the plant has been designed to utilize all available space. As stated above, the quarry is in the side of a high bluff facing the river with the floor level at the top of the primary crusher. This crusher is set in a pocket in the bluff so that three sides are enclosed by rock, only the side toward the river being open. Running beside the primary crusher and only a few feet below its discharge is the main-traveled concrete road which leads from Dubuque to the Eagle Point bridge over the Mississippi, which is located a few hundred yards up the river from the crushing plant. (This road, which is the chief Iowa - Wisconsin highway, was only paved during the last few months, stone from the Dubuque plant being used for the aggregate.) Just east of the road and situated on rock and masonry at the same level as the road surface is the building enclosing the scalping screen and the secondary crushers. This is connected on the west by the belt conveyor to the primary crusher, and on the east by conveyors to the building containing the sizing screen and the storage bins. This latter building is set at the foot of the bluff, some 30 ft. lower than the plant housing the secondary crushers. From this point it is something more than 100 yd. to the shore of the river, and the ground is all level. The main line of the C. M. & St. P. R. R. runs beside the building containing the bins, and between the tracks and the river there is a large storage yard.

Shovel loading stone to one of the trucks in the quarry

Crushing and Screening Equipment

The belt conveyor from the primary crusher delivers the stone to a 60-in. by 16-ft. Allis-Chalmers scalping screen having a 9-ft. dust jacket, and driven by 15-hp. General Electric motor. Oversize from this screen flows directly to a No. 7½ Austin gyratory crusher driven by a 100-hp. General Electric motor. The secondary crusher discharge passes to a 26-in. Austin bucket elevator. The stone from ½-in. to 2½-in. from the scalping screen drops directly to the same bucket elevator. Stone smaller than ½-in. from the dust jacket of the scalping screen falls to an 18-in. Stephens-Adamson conveyor, on 30-ft. centers driven by a 15-hp. Allis-Chalmers motor, and is taken to a battery of vibrating screens in the next building. In the building with the scalping screen there is also a No. 5 Austin gyratory crusher, as well as the No. 7½ Austin mentioned above. This crusher receives the rejects from the sizing screen in the next building and its discharge also flows to the 26-in. bucket elevator. A 75-hp. General Electric motor is used on this crusher.

Truck dumping to the primary crusher

In this building also, on the first floor, is the room for

Dumping quarry stone to the primary crusher. Note the high quarry face behind

controls for the equipment in the plant. Even the control box for the electric shovel in the quarry is located here. The orderly, well labeled arrangement of the control boxes makes the operation of the electric equipment both simple and safe. It is noted that full electrical equipment throughout the plant has cut the force of men required to a minimum.

The 26-in. bucket elevator is driven by a 25-hp. Allis-Chalmers motor and is of 35-ft. centers. It raises the rock to a 24-in. Stephens-Adamson belt conveyor driven by the same motor that drives the elevator. This conveyor takes the material to the next building and delivers it to two 60-in. by 24-ft. Allis-Chalmers sizing screens having 10-ft. dust jackets. The screens are driven by two 25-hp. Allis-Chalmers motors. Four sizes are obtained from these screens, ¼- to 1-in., ¼- to 1½., ¼- to 2½-in., and ⅛- to ½-in. The first three come directly from the screens and the last size from the dust jackets. The rejects from the screens either drop to a bin for fluxing stone (over 2½-in.) or pass to a 16-in. Stephens-Adamson conveyor of 63-ft. centers, which carries it back to the No. 5 Austin crusher in the other building for recrushing, as mentioned above. This conveyor is driven by a 3-hp. Allis-Chalmers motor.

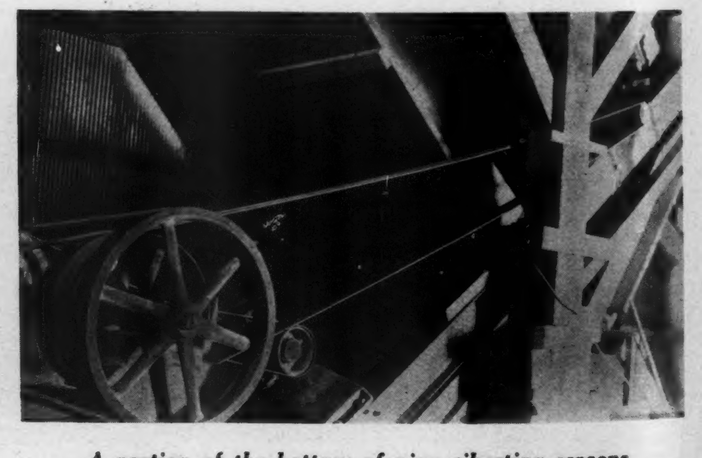
Bin Arrangement

There are five bins below the sizing screen and the 2½-in., 1½-in. and 1-in. stone goes directly to these bins, the chutes being so arranged that different bins may be used, or a combination of sizes may be put into a bin. The material from the sizing screen dust jacket goes to two vibrating screens, one being a Universal and the other a Leahy. These two screens are mounted with the seven Universal vibrating screens which receive the dust from the jacket of the scalping screen, but there is no passage of material from one set of screens to the other. All nine vibrating screens are driven by one 15-hp. Allis-Chalmers motor, through a Texrope drive. Material passing through either the battery of seven screens or the two screens falls to a short belt conveyor below the screens. The ⅜-in. rejects are used in concrete and resurfacing work, while the material from ⅛-in. to dust is sold as agricultural limestone. The short belt conveyor deposits the material in a bin below the screens, or may be adjusted to carry the stone outside the building to another belt elevator which takes it over the tracks of the C. M. & St. P. R. R. and deposits it on the stockpiles beyond. The rejects of both sets of vibrating screens may also pass by chutes to what is called the highway bin. This bin contains stone from ⅜-in. to 2½-in., to be used for road construction work. Into this bin stone of the different sizes from the sizing screen above is deposited as desired.

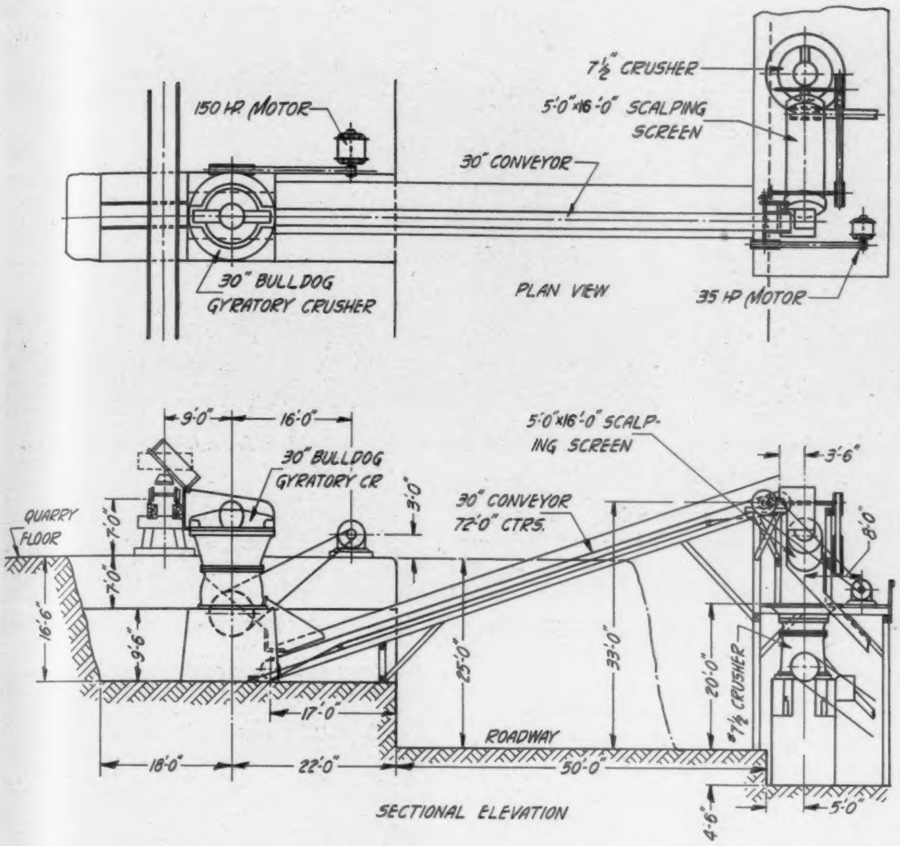
The main line of the railroad runs directly to the east of the screening plant and there is one side track east of it to serve the stockpiles, and another directly under the bins of the screening plant. The latter is 1400 ft. long, while the track for the stockpiles is about 400 ft. long. The two tracks combined will accommodate about 40 cars. Located under the bins is a Clyde car puller for spotting the cars, having a capacity for

The secondary crusher receives the rejects directly from the scalping screen

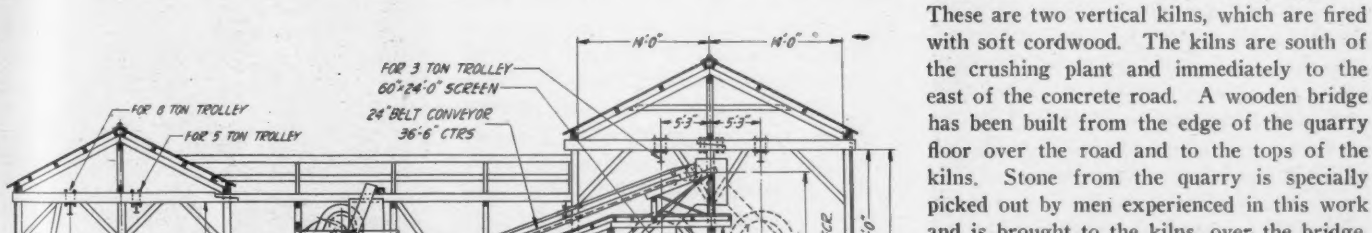
The control board which controls every piece of machinery in the plant



A portion of the battery of nine vibrating screens in the plant



Plan and section of the primary crusher and the conveyor to the scalping screen



Section showing the scalping screen and secondary crusher at the left, and screening equipment at the right

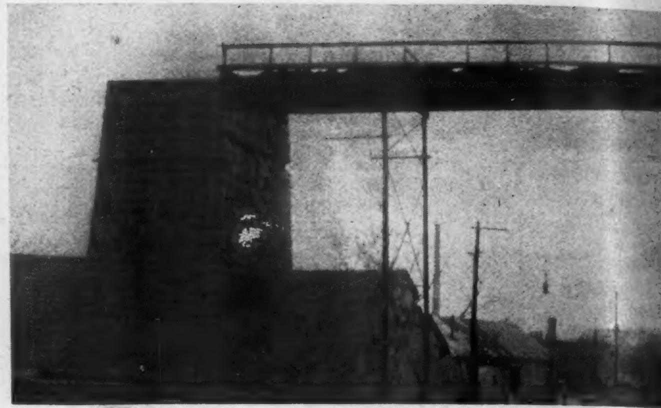
pulling 20 cars at once. The bin gates are 20x20-in. and it is possible to load a 50-ton gondola car in approximately seven minutes through them. Under the west side of the building containing the bins is a roadway for loading trucks. Five chutes from the five bins make loading convenient and rapid.

Storing the Agstone

The agricultural limestone is stored by means of a 1¾-yd. Sauerman electrically-operated dragline, and is reclaimed by the same dragline, loading either into trucks or cars on the siding. To utilize every bit of room available, storage space on the floor of the quarry is also being used. The larger size is taken from the bins by trucks and removed to the quarry, where it can be reclaimed at any time there is a demand for it. Thus with storage for highway stone and agstone sufficient to last for some time, it would be possible to shut down the crushing plant for a time, should occasion arise, without any annoyance to customers.

Although the Dubuque Stone Products Co. is a comparatively new company, there has been a plant located on this site for many years. It is not exactly kown when the first company started here, but it is understood that the Eagle Point Lime Works began operating about 1850. The present company is continuing the burning of lime in the same kilns that have been in use for many years. These are two vertical kilns, which are fired with soft cordwood. The kilns are south of the crushing plant and immediately to the east of the concrete road. A wooden bridge has been built from the edge of the quarry floor over the road and to the tops of the kilns. Stone from the quarry is specially picked out by men experienced in this work and is brought to the kilns, over the bridge, in Chevrolet trucks. About 30 hours' burning is required and the kilns are drawn four times each day. Each kiln has a capacity for

Roadway and tracks under the bins for loading the stone to trucks and cars



The lime kiln, showing the bridge from the quarry floor for charging

Paul Nauman, general manager

75 to 80 bbl. of lump lime daily. This adds materially to the stock which the Dubuque company carries to meet the building supply requirements in Dubuque and the vicinity. The company has, in fact, built up quite a wholesale and retail trade in building supplies.

Convenient Transportation

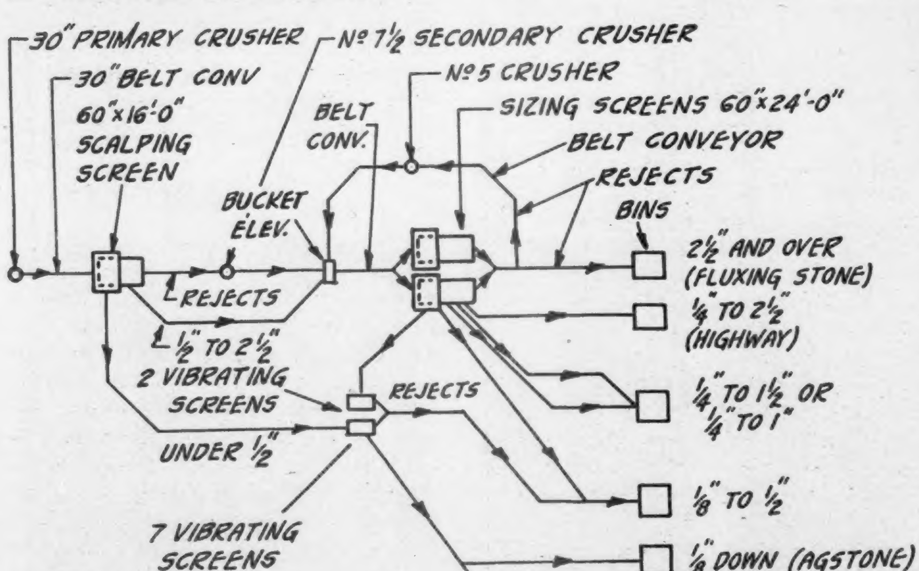
The company is ideally situated to distribute its products, being served by rail, water and highway. Through a switching agreement, the Illinois Central, the Chicago Great Western and the Chicago, Burlington and Quincy railroads can serve the plant over the rails of the Milwaukee road, making shipping over four main lines of transportation available. On the river, the plant is served by the Mississippi-Warrior Barge Line. The hard road makes truck delivery to nearby locations profitable, the company using chiefly Mack trucks for this work. Since the boundary between Illinois and Wisconsin is almost directly across the river from its plant, the Dubuque company is able to serve a considerable area in both of these states by means of the Eagle Point bridge, as well as covering the territory in Iowa. The city of Dubuque alone furnishes a good market, since it is a community of more than 50,000.

The rated capacity of the plant is 2000 tons of crushed stone and 400 tons of agstone daily. This, with an additional output of nearly 200 bbl. of lime daily, makes a generous production for any crushed stone operation. The plant was completed at a total cost of $225,000, the contractors being Braun Bros. of Dubuque. General designing of the plant was done by Allis-Chalmers Mfg. Co. of Milwaukee.

It is noted that the company is doing considerable local advertising, and has undoubtedly gained a large amount of good will among the people of Dubuque and the vicinity.

Recently the company has managed a fine stroke of advertising throughout the sur-

G. D. Rose, president of the Dubuque company



Flow sheet for the Dubuque Stone Products Co. plant

View of the Dubuque plant from the Eagle Point high bridge

rounding counties, by sending out about half a dozen trainloads of agricultural limestone to be delivered at convenient points along the various railroad lines in Iowa, as described in Rock Products for April 14. This direct-delivery system was extremely popular with the farmers who were thus saved the trouble of hauling the stone from stations at considerable distance. It is certain that the good will created in this way will always be an asset to the company in increased sales and good feeling.

The officers have been quick to see the value of this good will from the outside, as they have also been able to understand the advantage of building up a spirit of co-operation within the company. The force employed is comparatively small, but has shown a splendid willingness to work together for the good of the company.

G. D. Rose is president of the company, J. C. Collier is vice-president and Paul M. Nauman is secretary-treasurer and general manager. H. R. Manahl is superintendent.

Bulletin on California Mineral Production

THE Division of Mines and Mining of the state of California has recently published bulletin No. 100 on the mineral production of the state in 1926. Seven chapters are included, two of which are chiefly of interest to rock products producers. The chapter on structural materials includes reports on the production of cement, lime, stone, sand and gravel and similar materials, while the chapter on industrial materials covers gypsum, limestone, feldspar, silica sand, and a number of lesser products. The section devoted to each mineral is accompanied with tables showing yearly production for the past few years, value of the product, and in some cases other data. The final chapter in the bulletin is also of considerable value, as it gives the natural resources of each county in the state, for ready reference to one interesting in obtaining information about desirable locations.

H. R. Manahl, superintendent

The Dubuque plant during erection, showing type of construction used

Mineral Aggregate Resources of Iowa

Some Geological Reasons for Scarcity in Parts of the State

By Edmund Shaw
Editor, Rock Products

THE AGGREGATE INDUSTRY of Iowa has taken on an increased importance since a large state-wide highway improvement program has been decided upon. The project most favored calls for 4993 miles of paved highway, to be built in seven years, which will absorb some millions of tons of aggregate, and the growth of industrial towns and the improved general business conditions that the new highways will bring will take a great deal more.

The state has an abundance of limestone and gravel in the eastern part, gravel and some limestone in the central part and a little stream gravel in the western part. During a recent visit to the state highway department at Ames, L. W. Woods, the geologist of the department, showed the writer why this was so. The northeast corner of the state was pushed up at some time in geologic past, bringing the older rocks to the surface. The dip is such that these rocks are 2000 ft. below the surface at Des Moines, where they are covered with younger rocks and also with glacial drift. In the western part of the state are younger shales and sandstones and glacial drift that does not carry much gravel, and in some places there is a blanket of loess, the wind-blown dirt that probably came from the sun-dried bars of the Missouri river at periods of low water. The aggregates used in this part of the state are mostly brought in from Nebraska and South Dakota.

According to the highway department's records, there are about 60 producers of aggregate in the state, 16 of them working quarries and the remainder sand and gravel deposits. By far the greater part of the sand and gravel production comes from stream beds and terraces which are dredged, although some of the largest operations are in terrace deposits that are worked by dragline excavators.

Limestones of the State

The limestone ledges are the only rocks worked for aggregate. The Sioux Falls jasper (really a quartzite) outcrops in the extreme northwestern corner of the state, but it is not quarried, although this same formation is worked in South Dakota and in Minnesota and supplies a good deal of the aggregate that is shipped into Sioux City and other Iowa towns. This is the oldest rock in the state. Above it (geologically) is the Cambrian geological formation, which outcrops in the extreme northeastern corner. The exposure is of dolomite, but it is not worked. Above this is the lower Ordovician dolomite in which there is one quarry, that of the Marquette Stone Products Co., and in the upper Ordovician (Galena) dolomite there is the quarry of the Dubuque Stone Products Co. and some smaller workings.

In the Silurian rocks, above, are many quarries which were formerly worked for building stone, but which are now producing little or nothing. This stone is considered too soft for aggregate, but it has other excellent characteristics, one of which is its ability to withstand weathering. Buildings 50 years old, faced with this stone, look as fresh as though they were put up last year.

Iowa State Highway Department Building at Ames, Iowa

Aggregate producers will be interested to know that these rocks stand the sodium sulphate test very well, one instance in which the relation of this test to resistance to frost and weather is borne out. The quarries where this stone was produced are in and around Stone City, and one quarry still being worked is that of the state penitentiary at Anamosa, where both building stone and paving stone are produced. Possibly there might still be some demand for building stone from these old quarries if it were not that the colors, buff and brown, are now rather out of style.

The Devonian limestones above it are possibly the most valuable in the state commercially, although the exposure is only a somewhat narrow strip in the east central part. But these ledges supply the material for the cement plants at Mason City, the Lehigh and Northwestern States, and for the Dewey plant at Davenport. The plants which are expected to be built at Davenport will use it, and one of the companies, the Linwood Cement Co., has a large quarry producing crushed stone. The largest quarry in the state, Dolese Bros.' quarry at Buffalo, is in the Devonian, and other quarries in the same formation are the Builders Material Co. at Cedar Rapids and the River Products Co. at Iowa City. The rock is a high calcium limestone and it is quarried for iron and steel furnace flux as well as for aggregate.

The Mississipppian limestones are exposed in a longer belt of about the same width west of the Devonian exposures and in an area in the south, and they contain a number of quarries and furnish the raw material for the Hawkeye and Pyramid cement plants at or near Des Moines. The cement rock quarries working the Mississippian limestones are the Iowa Limestone Co., at Alden; the McManus Quarry, at Sandusky; the Keokuk Quarry and Construction Co., at Keokuk; the Burlington Quarry Co., at Montrose; the Le Grand Limestone Co. and the Howard Material Co., at Le Grand, and the Gilmore City Cement Co., at Gilmore City.

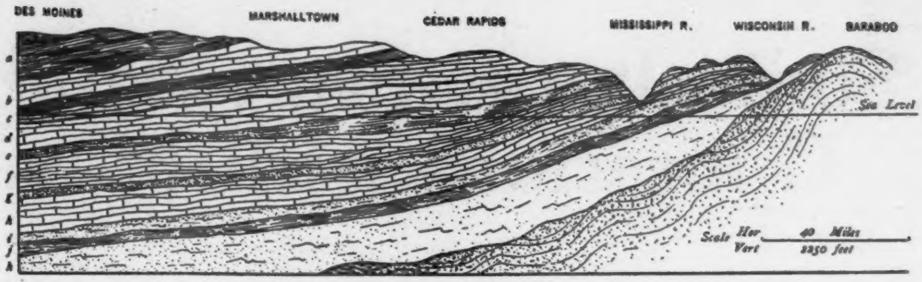
The Pennsylvanian rocks, as in most places, contain only thin ledges of good limestone, and there is only one quarry in them, that of the Peru Limestone Co. at Peru.

Sand and Gravel Deposits

All of Iowa was glaciated, but only one of the glacial drifts, the Wisconsin, carries much gravel. This drift lies in a tongue-shaped area terminating at Des Moines. The Iowa drift on the east and the Kansas drift on the west are made up principally of clay sand and boulders.

The list of sand and gravel producers is so long that they will not be mentioned by name, and only the localities and the rivers which are worked will be stated.

There are a few companies working within the Wisconsin drift area. They produce gravel of good quality, but many of the deposits in the Wisconsin drift area are not workable because they contain too much shale. One deposit sampled by the highway department contained 28% of shale. The department permits only ½% of shale in



The drift is not shown. The chief aquifers are the Saint Peter, the Jordan and the Dresbach sandstones. The line of juncture of the Dresbach sandstone and the underlying Huronian is hypothetical. a, Des Moines; b, Mississippian; c, Devonian; d, Niagaran; e, Maquoketa; f, Galena-Platteville; g, Saint Peter; h, Prairie du Chien; i, Jordan sandstone; j, Saint Lawrence; k, Dresbach

Geological section from Baraboo, Wis., to Des Moines, Iowa

paving aggregate, which bars many gravel deposits that are otherwise of good material. Since the shale-free gravel resources of Iowa are not large, a good commercial method of removing shale from gravel will be badly needed in the state some day. For testing gravel for shale, the highway department uses a solution of zinc chloride in which shale will float.

The stream bed and outwash deposits of the drift are freer from shale, or altogether free from it, because they are of material that has been sc washed and moved about that the shale has been ground to mud and carried away. Fortunately Iowa has many streams and rivers from which gravel and sand are taken. Some of the riverside deposits are terraces formed by the stream in an earlier time.

River Gravel Deposits

Beginning at the western border of the state and going east, the first gravel producing river is the Big Sioux, on which there are plants at Hawarden and Akron. These are about the only aggregate producing plants of any kind in the western part. The Milwaukee railroad has a large pit which it works to some extent for ballast.

System	Series	Formation	Columnar Section	Thickness Feet	Character of Rocks
Pleistocene	Wisconsin				
	Iowan				
	Illinoian				
	Kansan				
	Nebraskan				
Cretaceous	Upper Cretaceous	Colorado		150	Shales, with soft chalky limestones
		Dakota		100	Sandstone
Permian		Fort Dodge		50	Sandy shale and sandstone
				30	Gypsum
Pennsylvanian	Missouri	Wabaunsee		108	Shale and limestone
		Shawnee		233	Limestone and shale
		Douglas		26	Limestone and shale
		Lansing		34	Limestone and shale
		Kansas City		131	Limestone and shale
	Des Moines	Pleasanton			Shale and sandstone
		Henrietta		750	Shale and sandstone
		Cherokee			Shale, sandstone, coal.
Mississippian	Meramec	Ste. Genevieve St. Louis		0-40	Limestone
		Spergen Warsaw		35-105	Limestone
	Osage	Keokuk Burlington		150-215	Limestone
	Kinderhook			150	Shale and sandstone
Devonian	Upper Devonian	State Quarry – Lime Creek		40-120	Limestone Shale
		Cedar Valley		100	Limestone, shaly limestone. Some dolomite in the northern counties.
		Wapsipinicon		60-75	Limestones, shales and shaly limestones.
Silurian	Niagaran	Gower		120	Dolomite
		Hopkinton		220	Dolomite Very fossiliferous in places.
	Alexandrian			0-40	Limestone and dolomite.
Ordovician	Cincinnatian	Maquoketa		200	Dark shales, shaly limestones, and locally, beds of dolomite.
	Mohawkian	Galena		340	Dolomite chiefly. In places unaltered limestone.
		Decorah		0-40	Shales with thin beds of limestone
		Platteville		90	Marly limestones and shales.
	Canadian	St. Peter		80-160	Sandstone
		Prairie du Chien: Shakopee		20-80	Dolomite
		Prairie du Chien: New Richmond		20	Quartzitic sandstone
		Prairie du Chien: Oneota		150	Dolomite
Cambrian	Croixan	Jordan		100	Coarse sandstone
		St Lawrence		50	Dolomite, sandy
		Dresbach			Sandstone, with bands of glauconite
Algonkian	Huronian	Sioux Quartzite			Quartzite

Diagrammatic section of the rock formations of Iowa

The next is the Rock River, on which there are two plants at Rock Valley. Beyond is the Little Sioux on which there is a plant at Quincy near Cherokee. The glacial drift is said to be thicker at this point than elsewhere in the state, about 600 ft. in depth. A terrace deposit on this river is worked at Correctionville. Still further east is the Raccoon River, on which there is a plant at Van Meter. It is said that there are a number of deposits of excellent gravel on the Raccoon River, but they are so far from a railroad that they cannot be worked profitably.

The Raccoon River and the Des Moines River join at Des Moines and there are eight plants in and near Des Moines working the river beds and bottom land deposits. North of Des Moines, on the Des Moines River, are the plants at Graettinger, Fraser and Humboldt, all within the Wisconsin drift area, and south of it, outside the area, are the plants at Harvey, Tracey, Eddyville and Ottumwa, and finally at Keokuk, where the Des Moines flows into the Mississippi. The Des Moines probably produces more aggregate than any of the rivers within the state.

On the Iowa River are plants at Gifford and Marietta, at or near the edge of the Wisconsin drift, and to the south plants at Iowa City and Hills. On the Shell Rock River there are plants at Clarksville and Shell Rock, and on the Cedar River there is one plant at Gilbertsville and two at Cedar Rapids. The Turkey River has one plant, at Claremont.

There are sand and gravel operations all the way up and down the eastern border of the state which dredge the bed of the Mississippi. The principal points at which there are plants are Dubuque, Bellevue, Clinton, Davenport, Muscatine, Burlington and Keokuk. Besides the plants in the state there are plants in Illinois, at Moline and Rock Island especially, that ship part of their products into Iowa. One plant at Prairie du Chien, Wis., also ships in some gravel and sand.

It will be seen from the above that Iowa is fairly well provided not only with sand and gravel resources but with going, operating plants for producing the road aggregate that is being used now and is soon to be needed in larger quantities. The state is wisely making a survey of its highway aggregate resources.

Some Large-Scale Sand and Gravel Operations with Movable Plants

Gemmer and Tanner, Columbus, Texas, Have Developed Economical System of Working Comparatively Shallow Deposits

LARGE-SCALE OPERATIONS in sand and gravel with movable plants are rather a new thing. These plants are not to be confused with the *portable* plant, used by contractors, and occasionally by regular producers, for temporary operations. They are a part of a well-thought-out system for working a particular kind of a deposit in the most economical way. It is only to one type of deposit that the system is adapted, but working in these deposits they have put plants of the conventional type out of business. So far they have usually been put together in a rather crude way by the people who use them, but in one field they have been developed and standardized; and it is quite possible that some of the large machinery houses will make them as a standard machine before long.

Working the deposit with two draglines in series

Stripping piles on worked-out ground

Limiting Factors for Use of Movable Plants

The type of deposit to which movable plants are adapted must have the following characteristics if the production is to be carried on economically:

1. The surface must be practically level. The system cannot be used with high banks or on hilly ground.

2. It must be a comparatively thin deposit covering a large area.

3. Water for washing must be available without pumping from too great a distance.

4. There must not be much oversize, requiring crushing.

5. The market must not demand too many sizes, for only three sizes can be conveniently loaded.

6. If the water is deep enough to float a dredge, a dredge will perhaps be found cheaper for excavating the material.

These limitations would seem to confine the use of the movable plant system pretty narrowly, but there are still many deposits to which it is adapted. These are mostly in the Southern states where river bottom lands and old river terraces furnish ideal conditions for the use of movable plants.

Developed by Gemmer and Tanner

The system has been in use by Gemmer and Tanner of Columbus, Texas, for some years, and the credit of first working it out is usually given to this firm. W. H. Gemmer and J. O. Tanner are both engineers, the former a graduate of Purdue and the latter a graduate of Texas A. & M. College. Mr. Tanner has been in the sand and gravel business for years and has designed a number of plants of ordinary types and gravel dredges. He has also designed the dragline which his company makes and uses. The steel frame movable plant, the latest form the machine has taken, is his design throughout. So too is the system of opening up and working the deposit, which will be described here. At least three other companies in the same locality employ the method, and the practice is so much alike in all three operations that a description of the Gemmer and Tanner operation will be sufficient.

Colorado River Deposits

The deposits are in Colorado county, Texas, from 70 to 100 miles west of Houston. The Colorado river forks in Colorado county and the largest area of gravel land is found in the fork, although there are some scattered patches of gravel on the outside. One of these, at Eagle Lake, which is also owned and worked by Gemmer and Tanner, is the finest gravel deposit which the writer knows of in the South. It has been thoroughly drilled by oil prospectors and their well logs show the gravel to be 125 ft. deep, an almost unprecedented depth for deposits outside the glaciated area. The present owners have prospected it and worked it to some extent, enough to prove that the material is of excellent quality.

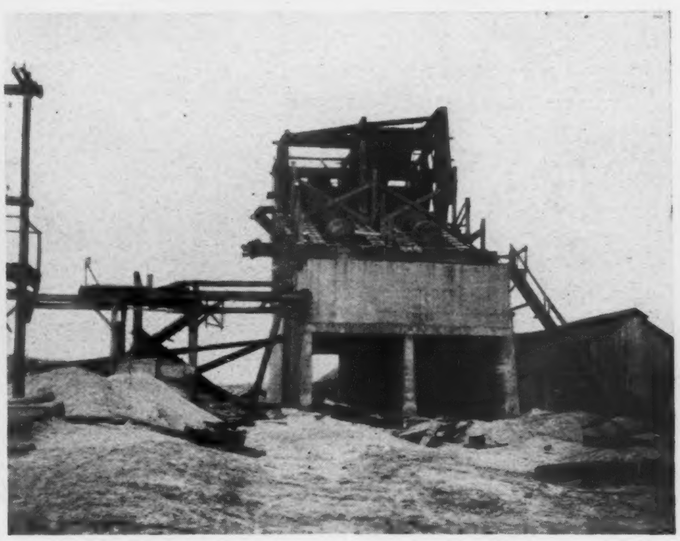
The geological report on this county by T. L. Baily, published by the University of Texas, is silent on the origin of these deposits. It does state, however, that they are in the Lissie formation, which is of Pleistocene age. All the pebbles which the writer examined at the Gemmer and Tanner pits were silica and most of them were flints. The geological report says that pebbles of chert and of pegmatite are also common. From the quantities of flint and chert present it is evident that the source of the gravels was limestone ledges that have long since disappeared, possibly the same as the Carboniferous limestones that were the origin of the gravels in the Trinity river deposits.

The depth of the deposits is stated to be from 15 to 75 ft. Those that the writer saw being worked had a depth of about 20 ft. They were on the third or fourth bottom of the river, a long level plain that is approximately 200 ft. above sea level for miles. Such a deposit is ideal for working by the system of movable plants, especially since it contains less than 5% of gravel large enough

The dragline and part of worked out area

The same machine seen from the other side showing plant

The Eagle Lake deposit is covered with heavy timber



Plant of the conventional type abandoned for movable plant

to require the installation of crushers.

System of Excavation

A retreating system of working has been adopted. The dragline and portable plant are sent to the far end of the property and work toward the main line of the railway. In the case of a long deposit, work may be begun at both ends. In one operation Gemmer and Tanner have two draglines, each with its movable plant, one following the other and making a cut of double the ordinary width. In this way the temporary tracks, from the field to the main line, may do double duty.

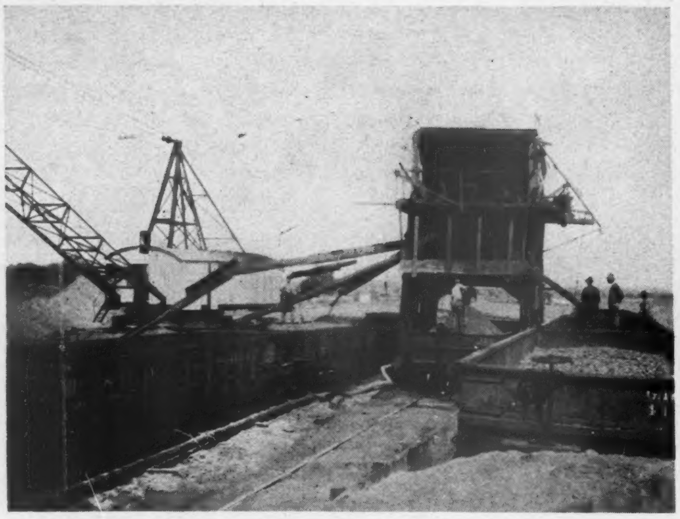
The dragline first makes a stripping cut across the property, piling the waste material on the far side. After this the gravel is removed and for the next cut the stripping is thrown into the trench left by the removal of the gravel. There is ordinarily from 2½ to 3 ft. of overburden to be taken care of.

Three tracks have to be laid parallel to the cut, one for each size of material to be loaded, usually sand, fine gravel and coarse gravel. These tracks are connected to a branch line that connects with the main line at the loading point, a sort of "home base," where the offices, warehouses and the machine shop are concentrated. At the end of a cut across the field the tracks have to be shifted the width of a cut, and about as easy a way to do this as any has been found to take up the tracks and re-lay them, but Mr. Tanner has recently worked out a sectional track system by which the tracks may be moved in sections, handled by the dragline. All tracks are necessarily of standard gage, except the short piece of track on which the movable plant itself rests, and this is of 15-ft. gage. The arrangement of dragline, movable plant and trackage is shown in the accompanying sketch. Usually 75-lb. re-rolled rails are employed.

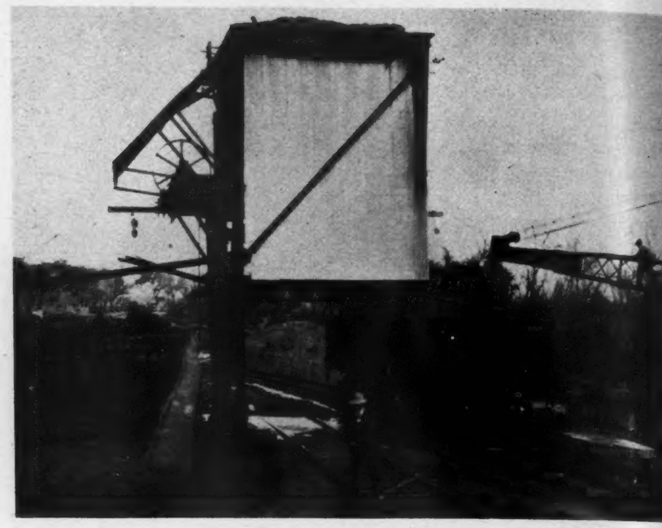
Most of the five or six movable plants of this company have timber frames, but one steel frame plant has been put in operation and a second was under construction when the field was visited. The steel-frame plant is so much better that the timber plants will be replaced by steel plants as soon as they show signs of deterioration, and it is the steel-frame plant that will be described.

Construction Details of Movable Plants

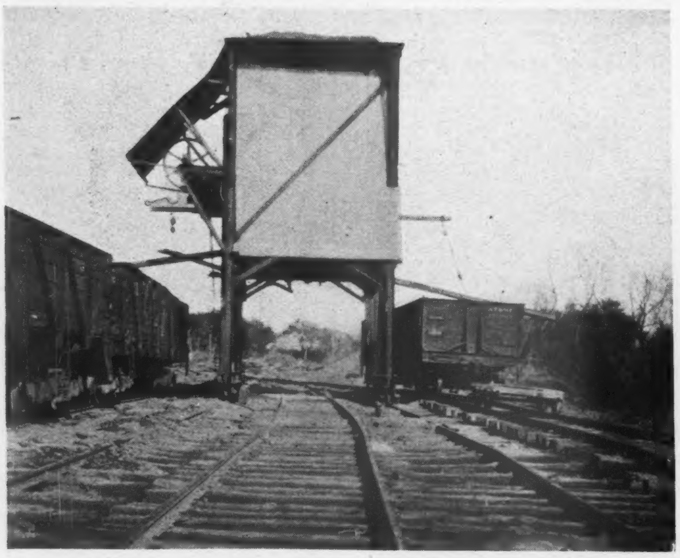
At the base are two girders made of two 10-in. heavy channel irons placed back to back. Each of these is supported on two 2-wheel trucks, the axles of the wheels being set so that they can move sidewise. The truck is pivoted to the channels to allow motion in the vertical plane, and with these two motions the wheel remain in contact

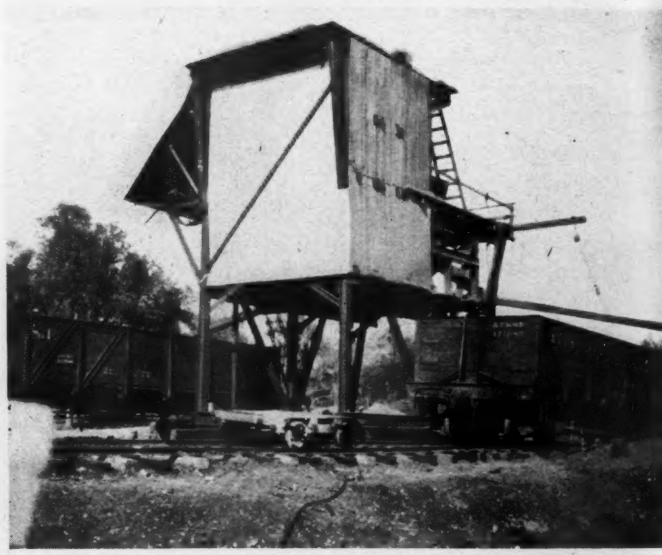


Timber framed movable plant at Columbus showing the three lines of cars and the dragline

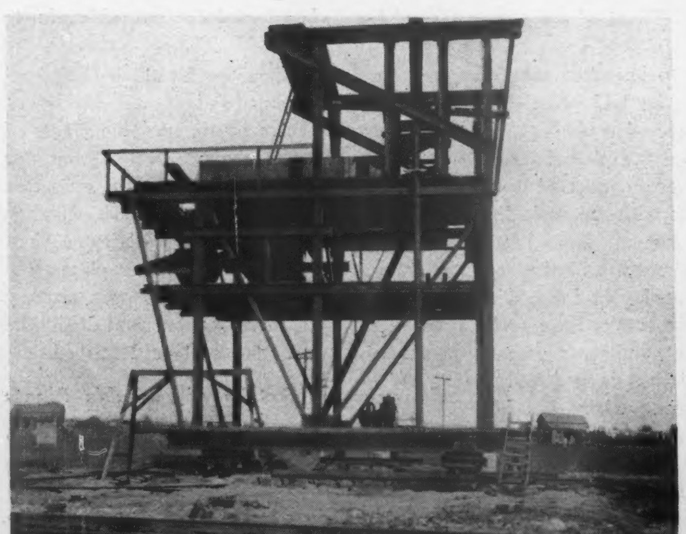


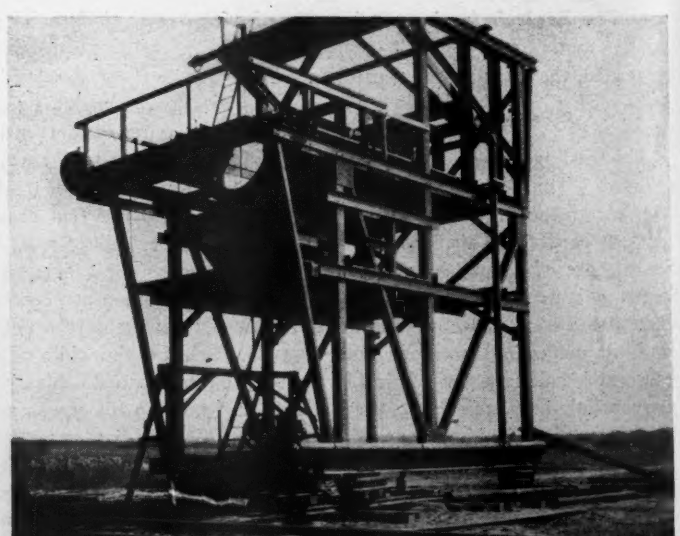
The first plant made with a steel frame installed at Eagle Lake on a deep deposit





End and corner view of the steel framed plant at Eagle Lake. This was installed mainly for testing the deposit and it will be displaced by a plant of a different type working with a dredge





Latest development of the movable plant under construction. Everything is made of steel. The frame rests on sills mounted on trucks that allow some movement vertically and laterally to avoid derailing

with the track in passing over ordinary inequalities of level. Six columns of H-section, three on a side, rise from these girders and they are connected with cross pieces and V-bracing. An angle-brace supports the overhang of the upper floor on which is the revolving screen.

are of ⅝-in. steel plate, cut out with a torch and reinforced with angle iron circles. The frames which hold the screen are of railroad rails and 2½x½-in. flat bars; and the screen is fastened to them by welding and the joints in the jacket are welded. This screen will stand up under the very rough service of the portable plant system, and when it is through with its work it is all through and goes back to the machine shop to be rebuilt. Punched metal sheets are used for main sections and heavy woven wire for the sand jackets. The perforations are usually 2-in. and 1¼-in., with 5/16-in. square holes in the sand jacket.

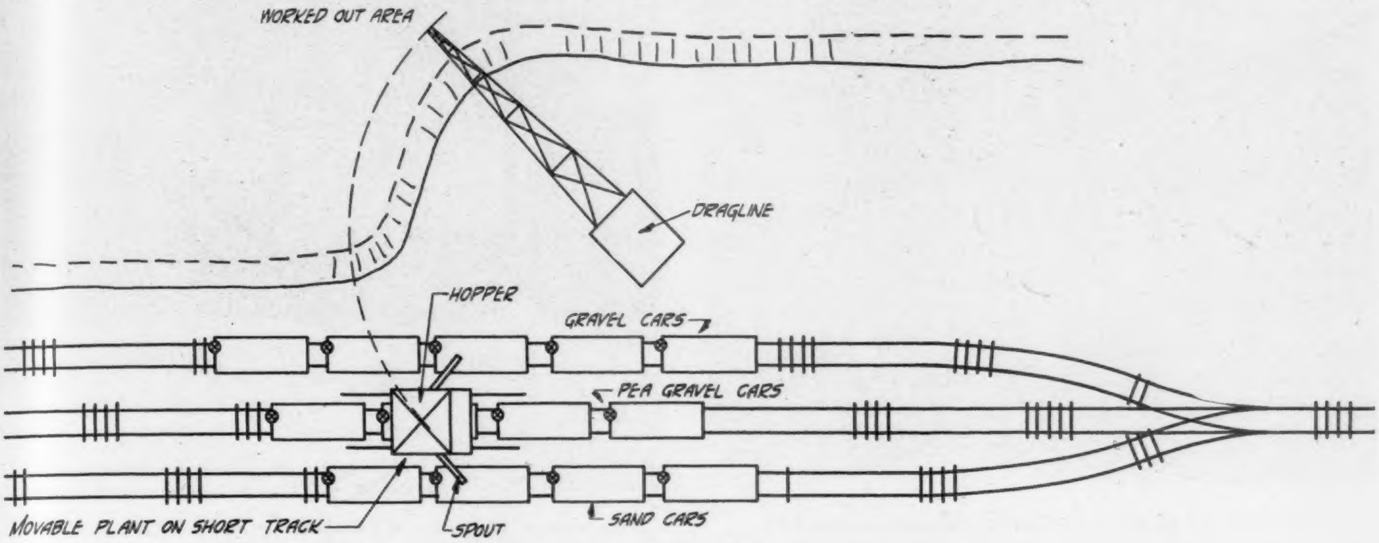


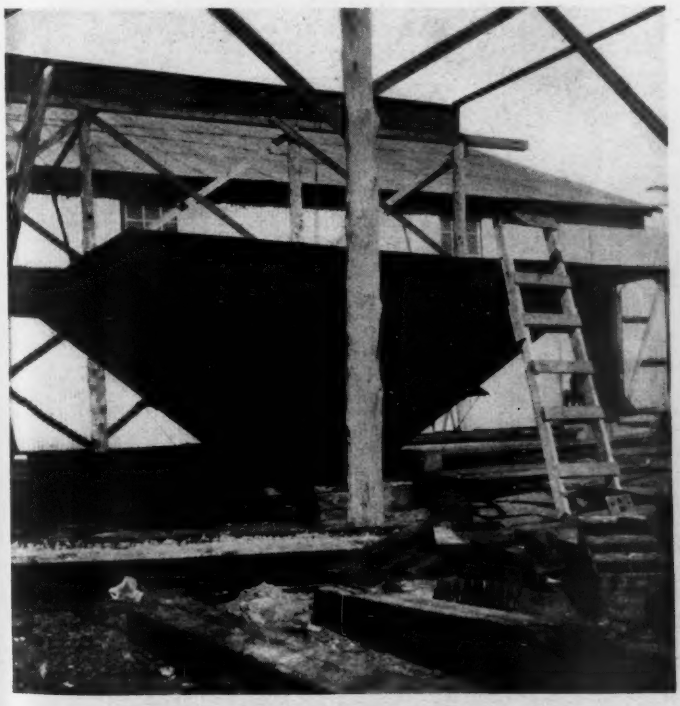
Diagram of the movable plant system at work

The dragline drops the bucket load into a 12-ft. square steel hopper, which is not shown in the picture of the frame, but is shown under construction in the yard. The sides slope about 30 deg. to the horizontal. At the bottom is a gate through which the bank material is fed into the screen. This screen is 16 ft. long, of 36-in. in diameter in the main section and of 48-in. and 60-in. diameter in the jackets, and it is especially constructed by Gemmer and Tanner in their own shops for this kind of a plant. The shaft is of nickel steel and the screen ends

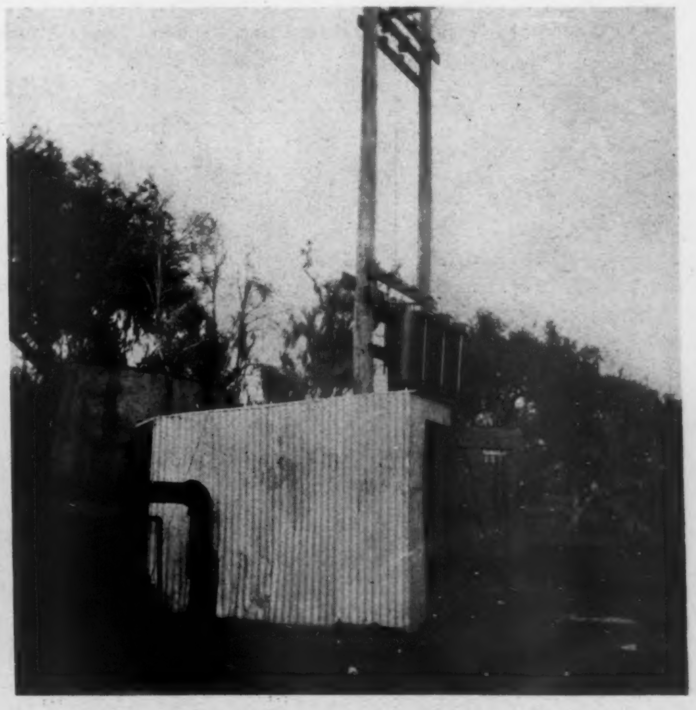
Screening Methods

The screen is set over a pan on the upper floor of the movable plant and driven by a 9-hp. gasoline engine, of one of the self-contained types built for farm use by different makers. The drive by which the speed reduction is secured is ingenious. The engine is belted to a 60-in. pulley on a shaft that passes across the plant in front of the machine. At the other end of this shaft is a miter-gear with a 5 to 1 reduction, and the pinion of this gear is connected with a shaft that drives the screen.

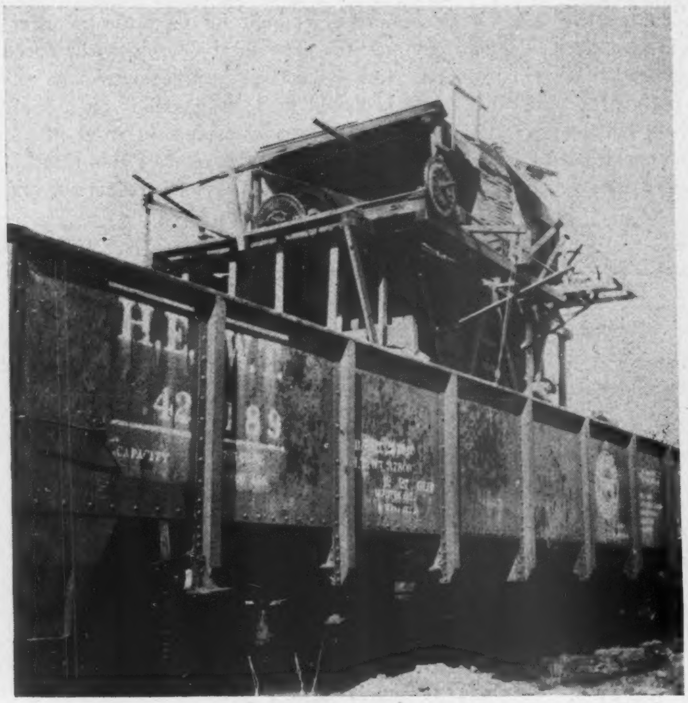
The oversize of the screen falls into a chute where it meets the water wasted by the sand hoppers below and is washed back into the cut. As the oversize is only 2½%, it has not been thought profitable to install a crusher, but at one of the other operations in the field (Horton and Horton) the oversize is saved and loaded into cars and sent to the Houston yards for crushing. The intermediate sizes, coarse and fine gravel, go to railroad cars and the sand and water



Hopper of new movable plant in the shop



Pump and motor house of water supply for movable plant



Close-up of a plant at Columbus showing screen drive

Side view of the same plant showing screen shaft and gear

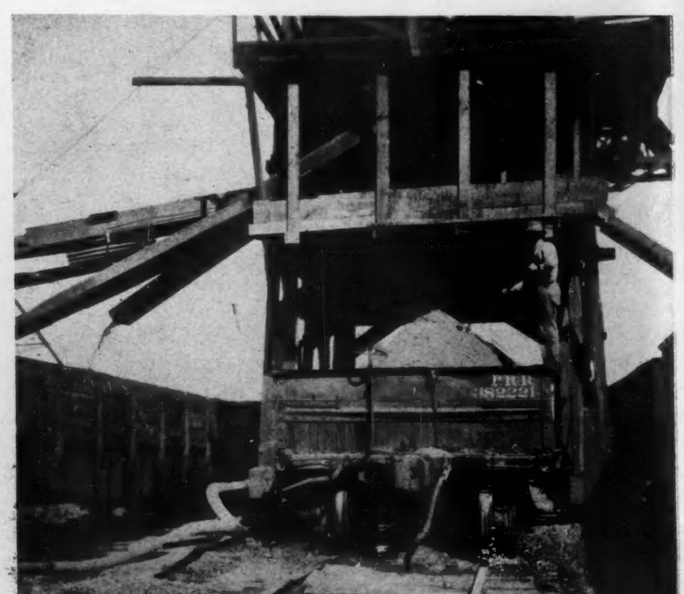
that passes the 5/16-in. holes of the outer jacket goes to two sand hoppers on the floor below. The hoppers are 5 ft. square at the top and the points go through the floor and are closed by simple sliding gates moved by hand levers. The sand hoppers may be worked in series to produce two gradings of sand or the products of the two may be combined to produce one, a general building sand, and this the usual practice. The three products fall into cars and there are three trains of cars, one for each product, but all handled by one locomotive. The company has seven locomotives in service, from 42 tons to 85 tons weight. Two of them are of the Shay-gear type.

The dragline excavators used with these movable plants were designed by Mr. Tanner and built or rebuilt at the company's shops, and they have some interesting points of difference from the usual design. In the first place, all frames are of structural steel instead of cast iron. Next, nickel steel shafting is used throughout and cast nickel steel gears and pinions in most cases. The shafting and castings are made to Mr. Tanner's drawings by the Hughes Tool Co. of Houston, but all the machinery is done in Gemmer and Tanner's shop at the Columbus operation. Power for the draglines comes either from a four-cylinder Fairbanks-Morse semi-Diesel engine or from a Tip three-cylinder engine of the same type. Both engines are of 120-hp. and use crude petroleum from local fields for fuel. The Tip engine is made by the Tip Engine Works, Austin, Texas, and has a very general use in the Texas coast country, where there is a good deal of pumping to irrigate rice fields.

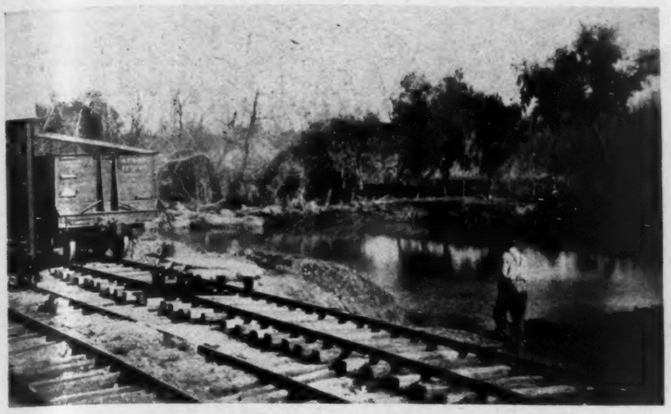
The engine is belted to the main shaft on which is the pick-up drum with its brake of the expanding belt type. The pull in drum is the same as the pick-up, except that it is driven through gears to half the speed for greater force in digging. The swing is connected by gears to the main shaft.

A small compressor furnishes air to the pneumatic controls by which the braking and other actions are applied. In connection with the swing there is an ingenious auto-

Bottom of deck with valves and levers of sand boxes



Below the plant shown above. Note loading chutes



Dragline pond on the Eagle Lake deposit

The "home base" containing offices and machine shops

matic valve by which the brakes are always applied when the valve is on the center-point so that there is no danger of dropping the bucket when the machine is at rest. Page buckets are used, of 2½-yd. capacity, and these, too, were made on the job, but under license from the owners of the patent until its expiration. The dragline has to lift 30 ft. above the rail to clear the hopper of the portable plant.

Moving the Operation

It is necessary to move up the dragline and plant two or three times in 24 hr. when the operation goes on with day and night shifts as it does in the busy season. The dragline track is in sections with V-shaped pieces at the end that insure alignment, and these are picked up by the dragline and placed in front of the machine when it is ready to move. The dragline also assists in moving the wide-gage track for the plant. Moving has been so systematized that it takes only a short period from each working day.

The loaded cars are sampled and marked with a sign, stuck into the sand before being shipped. The precaution of sampling and testing is a practical guarantee against rejections and the marking has been found a good advertisement. The great market for the field is in Houston, which has been growing very rapidly in the past few years, with concrete as the most favored building material.

For Prospecting Deposits

At the Eagle Lake operation Gemmer and Tanner have one of their movable plants (the first steel-frame plant built) and one of their draglines, but the operation here is more for prospecting and developing than for regular working. The water level is about 6 ft. below the ground level, so that the use of a dredge is clearly indicated. A dredge with a 15-in. pump is now being designed by Mr. Tanner and to use with this a plant of more conventional type, possibly like those which have recently come into use in the Montgomery, Ala., field, will be used. The movable plant could hardly be used with so large a dredge, although with a smaller dredge in a stream deposit it might be feasible to have a movable plant to follow the dredge up or down stream.

Low Cost the Specific Aim

In both operations production costs have to be kept low because the operations are distant from the main market and because not all the material produced can be shipped. Only the gravel is in strong demand; for plants nearer Houston, on the San Jacinto river, send a great deal of sand into Houston. However, the market for Columbus sand is improving, owing to its quality. It is practically pure silica and it is carefully washed and graded to meet the most rigid specifications, and a market at a higher price has been created by this attention to quality.

Columbus is the county seat of Colorado county and it was accounted a "dead little place" until the sand and gravel industry there began to grow. Now it is one of the livest places in that part of the state and several new buildings have recently been erected there.

Road Construction in 1928 May Exceed That of 1927

ROAD construction in 1928 will at least equal and probably slightly exceed the highest mark recorded in any preceding year, according to reports received by the Bureau of Public Roads of the United States Department of Agriculture and made public by the bureau.

Improvement of the state and Federal-aid highway systems under the supervision of the highway departments of the several states will go forward during the season now opening with a construction of more than 20,000 miles of surfaced roads and about 8,000 miles graded and drained.

The state reports also indicate that at least 240,000 miles of the total of 288,000 in the state highway systems will be maintained this year under the supervision of the state highway departments.

Funds estimated as available for expenditure during the year by the state highway departments are about 25% greater in total amount than similar estimates indicated at the beginning of last season. Although it is not possible, so early in the season, to anticipate closely the yield of gasoline and motor vehicle taxes and other sources of revenue it is practically certain that the funds available to all state highway departments for construction and maintenance of roads and bridges will exceed $750,000,000, and local revenues, expendable by county and local authorities, will swell the highway total to upwards of $1,300,000,000.

Details are not available concerning the work to be done by county and local authorities. It is anticipated that the year's work under state supervision will result in the construction of nearly 9,000 miles of hard-surfaced pavements, upwards of 12,000 miles of less expensive surfaced roads, and 8,000 miles of road adequately graded and drained.

Bulletin on Fuller's Earth in Pulaski County, Ill.

THE Illinois Geological Survey, Urbana, Ill., has recently published a "Preliminary Report on Fuller's Earth Deposits of Lamar County," by J. E. Lamar, of the State Survey. The report states that a field study of Alexander, Massac, and Pulaski counties revealed the presence of three deposits of clay in Pulaski county which is similar to the fuller's earth mined at Olmstead, Ill. The extent and character of these three deposits is not known except in a general way but they appear to be well worthy of testing and preliminary exploratory work. The report gives briefly the geology of the area with particular emphasis on the Porters Creek formation from which the fuller's earth at Olmstead is obtained. The Olmstead mines are described and illustrated. The potential deposits are made for directing exploration work. The results of preliminary tests on various clays from Illinois and elsewhere are given in two tables. Copies of the report are available at the office of the State Geological Survey at Urbana, for 50 cents.

Sand Settling and Devices for Settling and Classifying Sand

Part IV.—Calculating Apparatus Using Rising Currents

By Edmund Shaw
Editor, Rock Products

IN Part III of this series the calculations necessary to design a plain surface current settling box were given. In this part the calculations to design rising current classifiers will be considered.

The first form to be figured will be a simple sand cone. The same method applies to figuring the settling basin area of a drag or rake classifier, but the cone is chosen because the form is less simple and no allowances have to be made for moving parts. After this form has been figured a more complicated form employing two rising currents, one from the feed water and one from the hydraulic water employed, will be considered.

The sand cone is shown in section in Fig. 12. The feed of sand and water come down the launder and falls through the feed pipe into the body of the cone. There the coarse sand settles out and forms a basin, shown by the dotted lines, while the water, carrying the fine sand and clay, overflows. It is in the sand basin that the classifying, the separation of fines from coarse, takes place. The rising current, as shown by the arrows, is vertical in the center and almost horizontal at the overflow lip, but experiment has shown that it separates the fine from the coarse as it would if it were vertical.

The ring around the feed pipe is only to prevent air bubbles brought in with the feed from disturbing the water in the sand basin too much, but its size must be taken into account in the calculation.

Finding the Area for the Required Upward Velocity

What we want to find is such an area that the water rising through it will have the velocity sufficient to carry over particles of the size not wanted in the settled sand. And this area will be that of the top of the cone where the water overflows.

We will assume that the cone is to handle 50 tons per hour, that 300 tons of water will accompany the sand and that (in order to simplify the work) no account is to be taken of the fine sand and clay overflowing. We want to make a split on 65-mesh.

We are going to deal with a falling rate in inches and seconds so it will be convenient to convert all quantities and times to these units.

Calculating the Water Flow. The water is assumed to be 300 tons per hour. An easy way to get this into inches is to put it in gallons of 231 cu. in. We more often deal with gallons per minute than tons per hour anyway. Then as 1 ton = 240 gal. we have

$$\frac{300 \times 240}{60 \times 60} = 20 \text{ (gallons per second)}$$

$$20 \times 231 = 4620 \text{ (cu. in. per second)}$$

Calculating the Area. The current must have a rising velocity equal to the falling

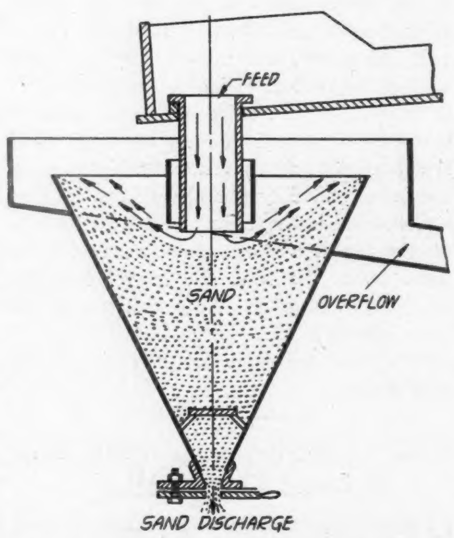


Fig. 12. Sand cone with rising current created by the feed water

rate of a 65-mesh grain, if we are to split the sand on that grain size. And this velocity, as we have seen, is determined by the area at the overflow. Hence, if we divide 4620 by 1.37 (the falling rate of a 65-mesh grain from Prince's curve) we will have the area required.

$$4620 \div 1.37 = 3372 \text{ sq. in.}$$

But a part of the area at the top of the cone is not active, as it is taken up by the feed pipe and ring. We will assume the ring to be 16 in. in diameter, and as the area of a 16-in. circle is 201 in. we will add 201 to the area already found. The full area then will be 3372 + 201 = 3573 sq. in. This is a circle and the corresponding diameter is 67.5 in. The cone therefore must have a diameter of 5 ft. 7½ in. at the top.

Calculating the Discharge Opening. The opening in the bottom of the cone must be calculated to make sure it is large enough for all the sand to flow out. This is simple because experience has shown that such an orifice (usually spoken of as a "spigot") will discharge about 200 lb. per sq. in. of cross section in one minute. We have only to find the pounds per minute discharged and divide by 200 to get the area wanted.

Fifty tons per hour is 50 + 2000 ÷ 60 = 1666 + lb. per minute. Dividing 1666 by 200 we have 8.33 sq. in. as the area required. This is a circle about 3¼ in. in diameter, but it would be better to make it 3½ in., or even 4 in. to allow for periods of overfeeding.

This figure of 200 lb. a minute holds good only for spigots of 2½-in. diameter and larger. It is very much less for smaller sizes owing to the greater friction developed by the flow. But spigots smaller than 2½ in. are not much used in rock products industries.

The spigot is shown here closed by a hand-regulated gate, a poor contrivance at best. Sand cones used commercially are fitted with automatic discharge arrangements, and these are to be preferred, as they lessen the attention needed. They will be described along with other commercial machines.

Fig. 12 shows that a circular plate or diaphragm is placed in the cone a short distance above the spigot. This does not affect the classification, but it helps to prevent the formation of a channel in the center of the cone and the rush of water and sand that would follow.

Classification With Hydraulic Water

Sand cones and similar separators are not very good classifiers on coarse meshes, according to the writer's experience. For coarse grain separations it is necessary to use hydraulic water to keep fine grains out of the spigot.

In order to show a simple but workable classifier using hydraulic water, a launder pocket taking out grains from ¼-in. to 10-mesh has been chosen. It will be designed to handle 50 tons of sand and 300 tons of water per hour. A cross section and a longitudinal section are shown in Fig. 13.

It will be assumed that the pocket is to be placed in a launder 2 ft. wide. The ris-

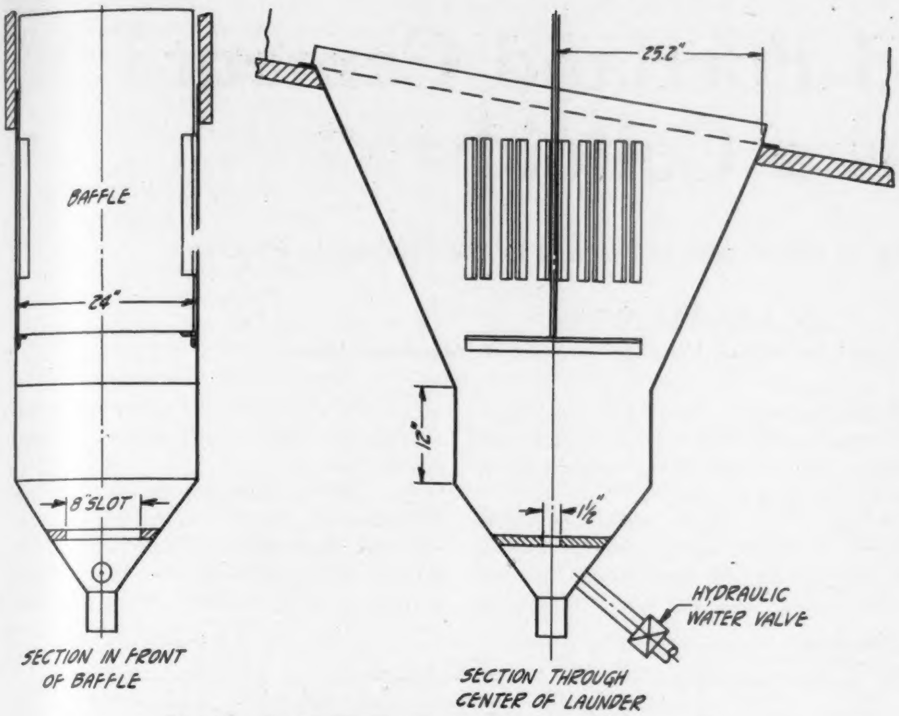


Fig. 12. A simple classifier using two rising currents

ing current is made by a baffle so that the current flows down one side and up the other. We need then to calculate only one dimension, the distance from the baffle to the edge of the classifier, the other dimension for the space through which the rising current passes being the width of the launder. This dimension is given as 25.2 in. in the drawing, and the way it is obtained is as follows:

The water flow, as before, is $300 \times 240 \div 60 \times 60 = 20$ gal. per sec., which is 4620 cu. in. In addition to this we have the hydraulic water to calculate. This water comes from the pipe shown below at the right and passes through a slot. The dimensions of the slot can be anything that will pass the grains comfortably, and in this case a slot 8-in. by 1½-in. has been assumed.

Since the quantity of water passing equals the area times the velocity we can figure it if we know the falling rate of the grain we wish to admit or just balance. This grain is 10-mesh and the falling rate is 8.5 in. per second. As before, we must correct the falling rate for the specific gravity (1.14) and this correction reduces the falling rate to 7.8 in. per second.

The dimensions of the slot are 8x1½ in. or 12 in., so the water passing will be 12×7.8 or 93.6 in.

The total water then is $4620 + 93.6$ cu. in. or 4713.6 in. Dividing this by 7.8 we have 604.3 sq. in. as the area wanted, and since the pocket is 24 in. wide, the other dimension is $604.3 \div 24$ or 25.2 in.

The baffle is a steel plate which slides in grooves made of channel iron. Other grooves are provided so that the baffle may be shifted to the right or to the left. Shifting it to the left throws finer grains to the overflow and shifting it to the right throws coarser grains into the overflow.

The hydraulic water must be regulated to correspond with the rising current in the pocket. If it is made too strong there will be an accumulation of grains in the pocket that will finally go out as a mass or form a bank and fall so as to choke the slot.

This type of classifier has been used to "rough off" a product which was afterwards dried and screened to make special sands. By discarding the greater part of the fines a product was left that cost much less to dry and that could be sceened more easily.

(To be continued)

Production of Magnesite in 1927

THE production of crude magnesite in the United States in 1927 was 121,490 short tons, valued at $1,090,550, according to statistics compiled by J. M. Hill, of the United States Bureau of Mines, Department of Commerce. Three operators, working three mines, one each in Santa Clara, Stanislaus, and Tulare counties, in California produced and sold 43,750 tons of crude magnesite, valued at $507,500. All of the output in Washington was from the mines of the Northwest Magnesite Co., which produced dead-burned magnesite at Chewelah. Two of its six furnaces were operated only part of the year.

Sales of magnesite of domestic origin in 1927 were 1,800 tons crude, 13,890 tons of caustic calcined (a decrease of 25% as compared with 1926), and 40,210 tons of dead-burned (a decrease of 5% as compared with 1926), having a total value of $1,460,240.

MAGNESITE SUPPLY IN THE UNITED STATES—1922-1927 EXPRESSED AS CRUDE MAGNESITE, IN SHORT TONS

Year	Domestic	Imported	Total*
1922	55,790	217,861	273,651
1923	147,250	151,092	298,342
1924	120,100	148,700	268,800
1925	120,660	142,283	262,943
1926	133,500	196,318	329,818
1927	121,490	149,126	270,616

*Prior to 1924 a factor of 2 tons of crude to 1 ton of calcined was used in expressing imports as crude magnesite. Since 1924 the factors used are 2 to 1 for imports from Italy and 2½ to 1 for other imports.

Imports of magnesite in 1927, according to the Bureau of Foreign and Domestic Commerce, were 891 short tons crude, valued at $9,790, of which 88% came from Greece; 9,463 tons of caustic calcined, valued at $229,592, of which 60% came from India and 33% from the Netherlands; and 49,873 tons of dead-burned, valued at $727,881, of which 75% was from Austria and Czechoslovakia. Corresponding figures for 1926 are 608 tons of crude, valued at $6,555; 14,830 tons of caustic calcined, valued at $330,131; and 77,108 tons of dead-burned, valued at $1,128,823.

Prices

Quotations from the *Engineering and Mining Journal,* vols. 123 and 124, 1927, on crude magnesite during 1927 were $14 a ton. California Grade A, caustic calcined, ground 80% through 200-mesh, was quoted at $40 a ton throughout the year and Grade B at $38 a ton. Dead-burned was quoted at $33 a ton, f.o.b. California mines, until the first of November, when the price was reduced to $30 to $32 a ton. Quotations, f.o.b. eastern seaboard, were $40 a ton.

Domestic producers reported sales of crude magnesite at from $7.50 to $13 a ton, f.o.b. shipping point of mine, and the average price for all magnesite sold crude was $9.52 a ton. Producers of caustic calcined magnesite in the United States reported sales at from $30 to $34 a ton, the average price for the total sales of domestic being $32.60 a ton. Domestic dead-burned magnesite was sold at from $24 to $29 a ton, the average price for the entire output being $24.63 a ton, f.o.b. shipping point.

Producers reported stocks of 6,150 tons of crude magnesite at plants on December 31.

Import Duty on Magnesite

By proclamation, under the Tariff Act of 1922, the President of the United States on November 10, 1927, increased the rate of import duty on magnesite as follows: Crude magnesite from 5/16 to 15/32 cents per pound (from $6.25 to $9.375 a short ton); caustic calcined magnesite from 5/8 to 1 5/16 cents a pound ($12.50 to $18.75 a short ton).

DOMESTIC SUPPLY OF MAGNESITE IN VARIOUS FORMS IN 1927

Class	Sales (domestic) Short tons	Sales (domestic) Value (f.o.b. mine)	Imports Short tons	Imports Declared value	Total Short tons	Total Value
Crude	1,800	$ 17,130	891	$ 9,790	2,691	$ 26,920
Caustic	13,890	452,810	9,463	229,592	23,353	682,402
Dead-burned	40,210	990,300	49,873	727,881	90,083	1,718,181

Hydrated Portland Cement as a Colloid*

A Study of the Nature of the Products Formed in the Hydration Process

By Alfred H. White
Department of Chemical Engineering, University of Michigan, Ann Arbor, Mich.

PORTLAND CEMENT clinker is composed in part of rather definite crystalline compounds and in part of amorphous slag. There is some dispute about the exact formula for the definite compounds, but it is agreed that they are basic silicates and aluminates of lime. When water is brought in contact with ground clinker, the constituents react and form compounds which are in part crystalline and in part amorphous. The character of these hydrated compounds depends upon a number of factors, but largely upon the amount of water used. Several investigators have attempted to determine the products formed when cement reacts with an excess of water, but have only established that the products hydrolyze, as was to have been expected, calcium hydroxide going into solution and more siliceous products remaining in the solid state. Treatment of these solid products with successive portions of fresh water gave a continually changing product without a definite limit being reached. This procedure throws very little light upon the reactions when portland cement is used as a structural material, for an excess of water is never employed when portland cement is used in practice, and the calcium hydroxide formed through decomposition of the cement clinker separates in the solid phase as one of the constituents of the concrete. In practice, from 50 to 75 lb. of water are used for each 100 lb. of cement.

There is no definite or theoretical amount of water which can be said to enter into combination with portland cement. For gypsum, which is one of the simplest hydraulic cements, a definite equation is usually written with the final product expressed as $CaSO_4 \cdot 2H_2O$. Portland cement has various components and some of them, at least, do not form crystalline compounds. The case is further complicated by the fact that even though the cement is very finely ground, it is only the external surface of the fine cement particles which react with water. If concrete which has been under water for years is examined microscopically it will be found that there are still nuclei of unchanged portland cement clinker which have failed to hydrate.

The first clear treatment of the reactions which take place on the hydration of portland cement was contained in a study by H. Le Chatelier[1] in 1889. The next important contribution was made in 1893 by Michaelis,[2] who enunciated the colloidal theory of the hydration of cement.

It was H. Le Chatelier[3] again who in 1900 showed that there was an absolute decrease in volume of the wet paste during the hardening process. This was later confirmed by Kühl,[4] one of whose experiments may be cited. A paste made from 250 grams of cement and 200 c.c. of water was put into a graduated flask and the space remaining above the paste was filled to the graduated mark with clear water. There was a shrinkage after 24 hours of 5.0 c.c., after seven days of 10.6 c.c., and after 28 days of 13.6 c.c. All cements showed this contraction, which continued up to the time when expansion of the cement in the bulb of the flask cracked the glass.

Quantitative measurements of the slow expansion of cement while it lay in water were first made by Bauschinger[5] in 1879. It became well established that bars of wet portland cement expanded during the first year of immersion in water and then reached a steady state with an elongation of from 0.10% to 0.15%. It was also well known that bars of wet cement kept continuously in air after they were removed from their molds showed a shrinkage for several months, but ultimately reached a fairly steady state with a decrease in length of from 0.24% to 0.39%.

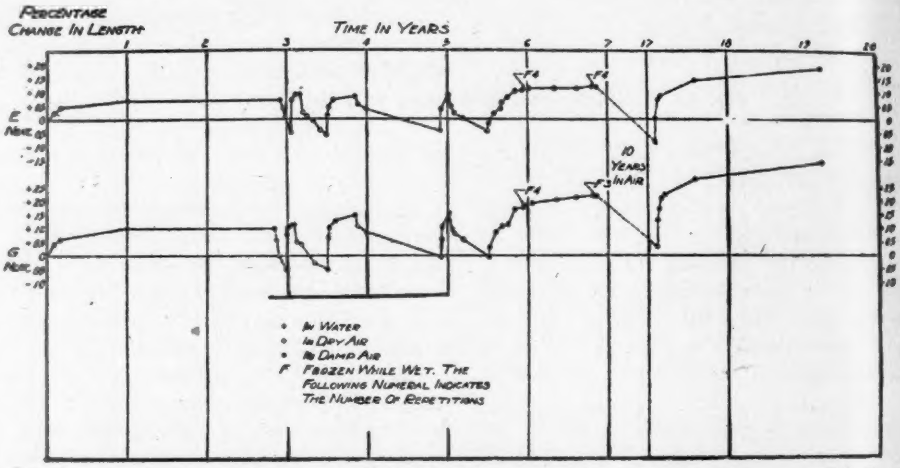


Fig. 1. Percentage changes in length of bars of neat cement when wet, dried, exposed to damp air and frozen while wet

Expansion and Contraction with Change in Moisture Content

It fell to the present author[6] to first show that cement bars which had reached a steady state in either air or water, changed their length with their moisture content and could be made to vary from 0.15% to 0.25% in length with each alteration between the wet and the dry state.

This is illustrated in Fig. 1, which shows the changes which have taken place in two bars of neat cement during a period of more than 19 years. Both *E* and *G* were commercial cements complying with standard speci-

> **Editors' Note**
>
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[2]*Chem. Ztg.*, 17 (2), 1243 (1893).
[3]*Bul. Soc. de l'Encouragement*, 5th Series V, 5, p. 54.
[4]*Tonind, Ztg.*, 36, 1331 (1912).
[5]*Mitt. Lab. Techn. Hochschule Munchen*, Heft 8, 1879.
[6]*Proc. Am. Soc. Test. Mat.*, 11, 531 (1911), 14, 203 (1914).

fications which were made into bars approximately 100 mm. long and 25 mm. square with glass plates cast in the ends to give a smooth surface of contact for the micrometer. They were mixed with water to normal consistency, molded and kept damp for 24 hours, after which they were removed from the molds and measured. This measurement was taken as the zero measurement and all elongations were recorded as plus variations, and all contractions as minus variations from this original zero length. It will be noted that in each case there was slow expansion while lying in water at room temperature and that a constant length was reached after a year. After aproximately three years in water the bars were placed in dry air at room temperature with a resultant gradual contraction which caused the bar to become shorter than its initial measurement. On reimmersion in water expansion resulted and this same cycle of changing length has been repeated with each change in environment.

This behavior is not peculiar to these two cements, but is characteristic of all portland cements, even those of rather unusual composition. The obvious explanation is that the colloidal gel maintains its reversibility at atmospheric temperature for a very long time. The behavior of bars made in this laboratory which have been under observation for more than 20 years substantiate this explanation, and test bars cut from old sidewalks permit the conclusion to be extended to still older specimens.

The alternations in length as shown in Fig. 1 not only continue without diminution but actually increase in amplitude with successive swings. This is quite clearly due to the incomplete hydration of the particles of portland cement clinker. Microscopic examination of bars of cement which have been in water many years shows unchanged nuclei of cement clinker imbedded in a dense mass of alternation products. Water continues to act on the clinker until the gel becomes packed so tightly that no more water can force its way through. The cement or concrete will retain this condition unchanged so long as it is immersed in water. If the water is removed by evaporation, the dehydrated gel shrinks and the mass becomes porous. When it is again immersed in water, capillary action carries the water rapidly through the shrunken colloid to the particles of unchanged clinker with the result that additional hydration products are formed with a consequent increase in length over anything attained previously. On the first reimmersion in water at the end of the third year the expansion was about 0.15%. The latest immersion for two years shows an expansion of 0.27% for one cement and 0.31% for the other.

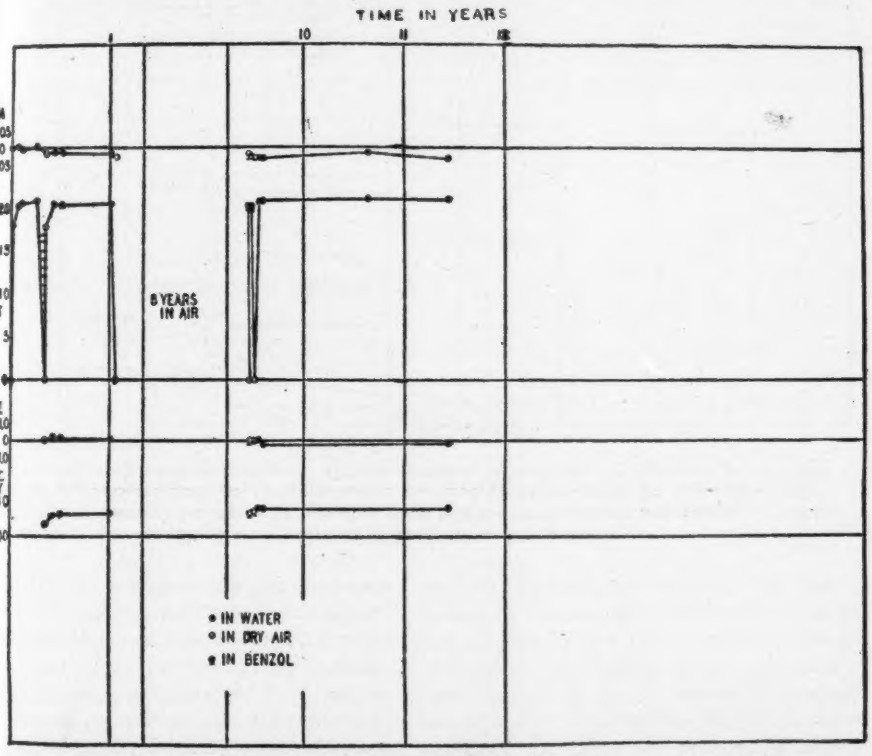


Fig. 2. Percentage changes in length, weight and volume, and variations in apparent specific gravity of a clay brick when wet, dried and immersed in benzene. Values for increase in weight and specific gravity on immersion in benzene have been recalculated to the basis of water

The effect of damp air is also shown in Fig. 1, where, between the fifth and sixth years, the bars after being air-dried were exposed to air almost completely saturated with water at room temperature. It will be noted that almost two-thirds as much expansion took place in damp air as on previous immersion in water for a similar period. The expansion of bar *E* in damp air amounted to 0.08% in two months, and the expansion of bar *G* amounted to 0.12% after three months in damp air.

The effect of freezing is indicated on these same curves by the letter *F*, which indicates that the bar was frozen while saturated with water. It will be seen that several successive freezings did not affect the length of the bar materially. A fuller study will be found further on in this paper.

Behavior of a Clay Brick

The behavior of a clay brick when immersed in water is shown in Fig. 2. This was a common brick taken from an old stuccoed building which was being torn down. An expansion bar was sawed from it, and studies were made, not only of changes of length but also of changes in weight and apparent specific gravity. The changes in length between the wet and dry state are less than one-tenth those noted with neat portland cement and amount to only about 0.02%. The brick is rather soft-burned and porous and absorbs 90% of the total water in two hours, and practically all of its water within a few days. The apparent specific gravity rises in the same period from 2.03 to 2.08 and stays constant. As a check on some later work, figures were obtained on immersion in benzol with a similar result. To make the figures comparable on the graph, the changes in weight and specific gravity on immersion in benzol are calculated to what they would have been if benzol had the same density as water.

Changes in Volume, Weight and Specific Gravity of a Cement Bar in Benzene and in Water

A more detailed study of the effect of water on a bar of neat cement is given in Fig. 3. This was a commercial cement which passed the standard specification and was made into a paste of normal consistency and molded into a bar. The bar was removed from the mold after 24 hours and measured. It was then kept alternately in air and water as shown on the graph and gradually became longer so that its length at the end of five years was +0.23% when it had been soaked in water for about a year. It was then set aside and allowed to rest for eight years in air dried with calcium chloride. When experiments were resumed, the bar was first soaked in benzene, then dried, and again immersed in water.

Details of the behavior of the bar in benzene and in water are given in the lower part of Fig. 3, although even in the detail the scale is not large enough to permit all of the tests to be shown.

The dried bar was first immersed in benzene in a vessel which was evacuated until the benzene boiled, and the bar was kept immersed in the benzene boiling at room temperature for half an hour. The bar was then measured, weighed in air, and suspended in benzene so that its specific gravity could be calculated. It was at once put back in benzene which was boiled at room temperature for another half hour. This was repeated five times and yet after these treat-

ments the bar had absorbed less than 0.4% of benzene by weight. It was then allowed to lie in benzene at atmospheric pressure with occasional measurements, as shown on the graph, for 19 days. It increased in weight 3.5% in this period and its apparent specific gravity rose from 2.218 to 2.279, but its length and its volume as determined by the benzene displaced did not change in any significant manner.

The slow infiltration of the benzene indicates that the capillaries were very small. Other work in this laboratory has shown that the capillaries of old cement bars become almost choked at the surface with calcium carbonate formed from calcium hydroxide which is drawn to the surface through the evaporation of water. The capillaries of the interior of the bar were probably not so minute as those at the surface. It seems fairly evident that the only action taking place in benzene was the slow infiltration of the liquid which gradually filled the capillaries, causing an increase in weight and apparent specific gravity without any measurable increase in length or volume. In the graph of Fig. 3, the increase in weight and volume have been recalculated to what would have been shown if benzene had the same density as water. This allows a direct comparison on the graph. The bar was then removed from the benzene and placed in a stream of dry air for 10 days. This was not long enough to remove all of the benzene since the weight did not drop entirely to the initial figure.

The next step was to immerse the bar in water and an attempt was made as with benzene to accelerate the infiltration by a partial vacuum. The increase in weight during the first half hour's immersion was only 0.13%, but on subsequent immersions at atmospheric pressure water continued to be absorbed, slowly to be sure, but distinctly more rapidly than was the case with benzene. A more noteworthy difference was the expansion that accompanied the absorption of water. In three days the linear expansion amounted to 0.23% and it rose more gradually as shown by the graph to a total linear change of 0.52% in two years. The changes in volume computed from the weight of water displaced are even greater than those obtained by direct linear measurement and indicate that the water had not penetrated to the center of the bar, only 25 mm. square, even after two years. It is probable that the colloid in the outer envelope became so dense that no more water could force its way through it. The bar was, therefore, not homogeneous but consisted of an expanded envelope in compression surrounding a core which was in tension. The measurements of length reflected the resultant of these two opposing stresses.

The graph of Fig. 3 ends with a record of the length of the bar after six months in dry air. At the present time the bar has been in dry air for two years and one month, but it is still showing a length of +0.315% and a weight of only +0.95%. There is a permanent expansion out of all proportion to the amount of water retained. This is explicable on the theory of hydration of clinker which had not been in contact with water previously.

Internal Pressures Produced by Adsorption of Water

An excellent review of the heat effects produced by adsorption and the consequent pressures which may be calculated has been given by Browne and Mathews.[7] Lamb and Coolidge[8] showed that the comparison of vapors adsorbed by charcoal as indicated by the heat of adsorption was in the neighborhood of 37,000 atmospheres. Harkins and Ewing[9] determined the volume of liquid adsorbed by thoroughly outgassed charcoal and calculated that water in the micropores of charcoal may be compressed about 25%. Nutting[10] has recently calculated that the compression of water on the surface of silica sand may be 17,000 atmospheres.

It is not feasible to apply the technique of these investigators to portland cement because heat is evolved in the chemical reactions accompanying the hydration of cement. The hydration does not become complete but fresh chemical action takes place with every immersion in water so that it is not possible to obtain reliable figures from the heat effects. Neither is it possible to pump out adsorbed gases completely because hydrated cement is altered by heat and gives up moisture for a long time in even a very incomplete vacuum. No attempt has, therefore, been made to determine the heat effects due to adsorption.

An attempt has been made to draw some conclusions from the increase in specific gravity. The apparent specific gravity of these bars was determined by weighing the bars while suspended in water (or benzene), removing from the liquid, wiping off the surface liquid, and weighing the bar quickly in the air. This latter process involved an error of appreciable magnitude which was reflected in an error of about three points in the third decimal place in the specific gravity. This was not large enough to obscure the trend of the results which change in the case of the bar of Fig. 3 from a specific gravity of 2.218 to one of 2.324, which is 35 times the probable error. The meaning of the increase in specific gravity is obscured by the compression of the gas remaining in the voids.

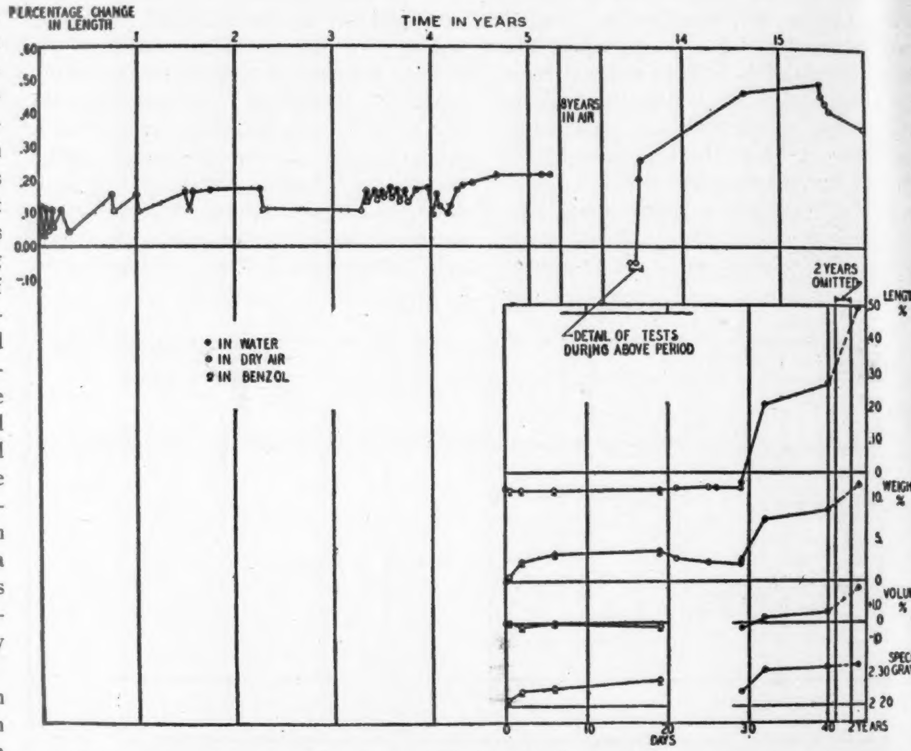


Fig. 3. Percentage changes in length, weight and volume and variations in specific gravity of a bar of neat cement, when wet, dried and immersed in benzene. Values for increase in weight and specific gravity on immersion in benzene have been recalculated to the basis of water

The slope of the curve of Fig. 3, showing increase in weight when immersed in benzene, indicates that absorption was nearly complete in 19 days. The absorption of benzene did not cause any measurable increase in volume but did cause an increase of apparent specific gravity due to slow displacement or compression of the air in the capillaries. The absorption of water caused an increase of 10% in volume and an increase in specific gravity much larger than that caused by benzene.

If it could be assumed that the volume of water in the capillaries was equal to the volume of benzene previously absorbed, and

[7] Alexander, "Colloid Chemistry," Vol. 1, pp. 450-470. Chemical Catalog Co., 1923.
[8] *J. Am. Chem. Soc.*, **42**, 1146 (1920).
[9] *J. Am. Chem. Soc.*, **43**, 1787 (1921).
[10] *J. Phys. Chem.*, 31, 531 (1927).

that the balance of the water was adsorbed in the micropores and was responsible for the expansion noted, it would permit calculation of the compression of the water. On this basis it would appear in that the water the micropores was compressed to less than half its initial volume. The uncertainties surrounding this calculation are evidently large, and little reliance is attached to it, except as a qualitative indication that pressures of large magnitude are involved.

Other evidence of the pressures developed may be found in the expansion in damp air noted in Fig. 1. The data are more complete for bar *G* and the numerical data for the test on this bar are given in Table 1.

It is apparent that the increase in length proceeds more rapidly than the increase in weight. It is probable that it is the expansion of the outer player which affects the length and that the slower penetration of

TABLE 1—CHANGES IN LENGTH AND WEIGHT OF A BAR OF NEAT CEMENT IN AIR SATURATED WITH MOISTURE AT ROOM TEMPERATURE

	Change in Length Per cent	Change in Weight Grams
On removal from dry air	—.002	138.95
7 days in damp air	+.028	
1 month in damp air	+.085	
2 months in damp air	+.103	141.37
3 months in damp air	+.116	142.35
2 hours in water in vacuum	+.125	144.00
1 month in water	+.174	146.67
2 months in water	+.178	146.80

moisture to the center relieves the tensile strains but does not cause commensurate increase in volume. Immersion in water causes further expansion and increase in weight as shown.

External Pressures Produced by Adsorption of Water in Concrete

The high pressures which have been determined by others as existing in the micropores of loose granules do not indicate the pressures which might be directed externally to cause deformation of solid bodies. The expansion of concrete gives some measure of this external pressure, although the situation is complicated by the probability that some fresh cement clinker is hydrated every time that concrete is moistened.

Hydrated cement is, to some extent, plastic and has no well-defined modulus of elasticity. A figure of 5,000,000 lb. per sq. in. is, however, rather frequently taken as an approximation of the modulus for rich mortars which have had adequate opportunity to harden. On this assumption an elongation of 0.1% corresponds to a stress of 5000 lb. per sq. in. This is about the load which rich concrete will bear in compression, and from five to 10 times the amount it will bear in tension.

The effect of expansion is evidenced in pavements and other structures exposed to the weather. The magnitude of the stress is in many cases sufficient to cause pressure ridges or upheavals in the concrete. The stresses produced by changes in moisture content constitute the fundamental cause of the disintegration of concrete as has been set forth more fully by the author elsewhere.[11]

Effect of Freezing While Saturated with Water

Freezing cement bars while they are saturated with water should cause an expansion which is a function of the amount of liquid water which the bars contain. Experiments were made by measuring the bars when removed from water, freezing them, measuring them while frozen, thawing them under water and measuring them again. The chief error in this work is due to the chance in the length of the cast iron yoke of the micrometer with change in temperature. The co-efficient of expansion of cast iron is closely that of cement, and the variation has not been determined for the lower temperatures. In this work it has been assumed that the correspondence remains the same, and only the differential change in length between cast iron and cement has been measured. That this experimental procedure is adequate is shown by the following illustration: A bar of rich lime mortar containing some portland cement had hardened for several months. It consisted of grains of sand, bonded together with crystalline calcium carbonate and a small amount of portland cement. Its water absorption was 15.1%. This bar, frozen while saturated with water and measured while frozen at 27 deg. F., showed an elongation due to freezing of 0.085%.

The neat cement bars of Fig. 1 showed on the contrary an apparent contraction when frozen, the contraction becoming greater at the lower temperatures. Some data are given in Table 2.

TABLE 2—VARIATIONS IN LENGTH OF A BAR OF NEAT CEMENT SUCCESSIVELY FROZEN AND THAWED WHILE SATURATED WITH WATER

	Length of Bar Mm.	
1. Immersed in water, at room temperature	102.828	
2. Frozen, at 5 deg. F.		102.812
3. Immersed in water, at room temperature	102.823	
4. Frozen, at 6 deg. F.		102.815
5. Immersed in water, at room temperature	102.825	
6. Frozen, at 9 deg. F.		102.816
7. Immersed in water, at room temperature	102.824	
8. Frozen, at 23 deg. F.		102.821
9. Immersed in water, at room temperature	102.825	

The total amount of water in the bar was probably about 11.0% and two-thirds of it was in such a state that it would evaporate in dry air. The bar of lime mortar noted above containing 15.1% of capillary water expanded 0.085% on cooling to 27 deg. F., but this bar of neat cement actually contracted slightly. The bar was six years old when tested and had been soaked two months in water just prior to the freezing tests so that there were no empty capillaries into which the ice formed could expand without causing an external stress. The explanation might be that the water was under such high compression that its freezing point had been lowered below 5 deg. F. or that the water was already in the solid state before it was frozen.

[11]*Concrete* 26, 157-161 (1925).

Conclusion

Portland cement clinker on hydration forms products some of which are crystalline and some of which form a stiff gel. This gel absorbs and gives up water with changing humidity of the air. A bar of neat cement may change in length more than 0.1% with alteration in atmospheric humidity. The linear expansion when changed from dry air to water will be greater than this and may be as great as 0.5%. The gel retains this reversibility at atmospheric temperature for at least 20 years, and there is nothing to indicate that it may not continue indefinitely. The magnitude of the expansion increases with the number of alterations between the dry and the wet state, due to the progressive hydration of particles of unchanged clinker. When a bar of hardened cement is transferred from dry air to benzene the capillaries become slowly filled with benzene with resultant increase in weight and apparent specific gravity, but without any change in the length of the bar. When the same bar, after evaporation of the benzene, is transferred to water the capillaries become filled with water with a resultant increase in weight, apparent specific gravity and length. The volume of water adsorbed may be three times as great as that of the benzene absorbed in the prior test. If it be assumed that the benzene filled the larger capillaries and that the surplus volume of water was all adsorbed in the micropores, the increase in volume of the bar should give a measure of the compressed volume of the water. An assumption of this sort indicates that the water was compressed to half its volume, but the figure cannot be given much weight because of the uncertainties as to the amount of air remaining in the capillaries on immersion in benzene and in water respectively. So also the increase in apparent specific gravity cannot be given much weight in computing pressures. Freezing tests on bars of well hardened neat cement saturated with water fail to show any expansion, although the bars contain about 11.0% of water, of which two-thirds is in such a form that it will evaporate in dry air and be absorbed again on immersion in water. In fact the bars of cement shrink to a greater degree than cast iron as the temperature drops further below the freezing point. This failure to expand at the freezing point may indicate a very high compression of the water or it may indicate that the water was already in the solid state before it was frozen.

The pressures due to adsorption are mainly internally directed, but they do produce a deformation of the bar. The modulus of elasticity of hardened cement mortar is low and hydrated cement is somewhat plastic. A compressive stress of about 5000 lb. per sq. in. will produce rupture of even the best concrete. The disintegration of concrete exposed to the weather is largely due to the expansion and contraction of the colloidal material coupled with the progressive expansion due to the hydration of fresh portions of clinker with each long immersion in water.

A Method for Interpreting an Analysis Using a System of Triangular Co-ordinates

A Practical Means for Obtaining Information from the Ordinary Analysis of Limestone, Shale or Cement

By Wm. A. Ernst*, Edgar S. Ernst† and Walter S. Ernst‡

As ORDINARILY REPORTED, an analysis of limestone and shale does not present any tangible information as to their availability for the manufacture of portland cement; nor does the ordinary analysis of cement show the engineer user whether a certain brand of cement specified for use in construction will be suitable for his requirements or not.

It is the purpose of this article to present a few points illustrating methods and means for attaining these results from the standpoint of both manufacturer and consumer.

Every live, up-to-date cement mill superintendent is striving to keep abreast of the times, and to do all in his power to produce a quality of cement equal to the best. This desire is becoming greater and greater daily, especially since new cements having special properties as to quick hardening and high early strength have appeared on the market.

Even though the existence of special cements may be short-lived, they will have a tendency to create a desire on the part of those engaged in the manufacture of ordinary cement to produce a product of superior quality. That this is within the range of possibility has been shown by modern research, but will not be discussed at this time.

Analysis Should Show Di-calcium and Tri-calcium Silicates Content

In order to make an analysis readily available to the busy engineer or contractor, it should be put into a form which will show the percentages of di-calcium and tri-calcium silicates it contains. This at once places the analysis in a different light, since it depends largely on the proportions of these ingredients present in a cement as to whether the cement will have quick-hardening properties or not. It has been shown (3) that the strength of both 7-day and 28-day periods increases with the percentage of the tri-calcium silicate. With a percentage of 65% of tri-calcium silicate, the progressive gain between 7 and 28 days is small, showing very clearly that a cement in which the tri-calcium silicate is strongly predominant will reach its strength at an early period. The amount of tri-calcium silicate which a cement can be made to carry without producing injurious qualities depends largely upon the manner of preparing the raw materials, as well as upon subsequent calcination, the degree of burning, rate of cooling, etc.

Richard K. Meade (2) states: "If the tri-calcium silicate is present in too small a quantity, the cement lacks plasticity, and will be quick setting. If present in too large a quantity, the cement has high early strength, with a tendency to fall off at later periods."

A graph for quickly ascertaining the amount of di-calcium and tri-calcium silicate as well as the tri-calcium aluminate present in a cement was developed by W. E. Haskel (1) in an article entitled "Notes on the Application of Meade's Formula," the method being as follows:

Assumed analysis:

Silica	21.5%
Alumina	5.9%
Fe_2O_3	2.3%
CaO	65.4%
MgO	1.9%
SO_3	1.7%
Loss	1.2%

Formula—

$$\text{Silica} \times Y + (Al_2O_3 + Fe_2O_3 \times 0.7) \times 1.7 = CaO + (MgO \times 1.4) - (SO_3 \times 0.7)$$

Substituting—

$$21.5 \times Y + (5.9 + 2.3 \times 0.7) \times 1.7 = 65.4 + 1.9 \times 1.4) - (1.7 \times 0.7) =$$

$$21.5\,Y + 12.77 = 66.87,\ Y = \frac{54.10}{21.5},\ Y = 2.53.$$

Y is the index at the bottom of the graph, and represents the ratio of the CaO present as silicate to the SiO_2 combined with it. The above formula also assumes the alumina present to be combined as tri-calcium aluminate.

Consulting the graph, Fig. 1, we find an index number of 2.53, showing the silicate to be composed of 27% di-calcium silicate and 73% tri-calcium silicate.

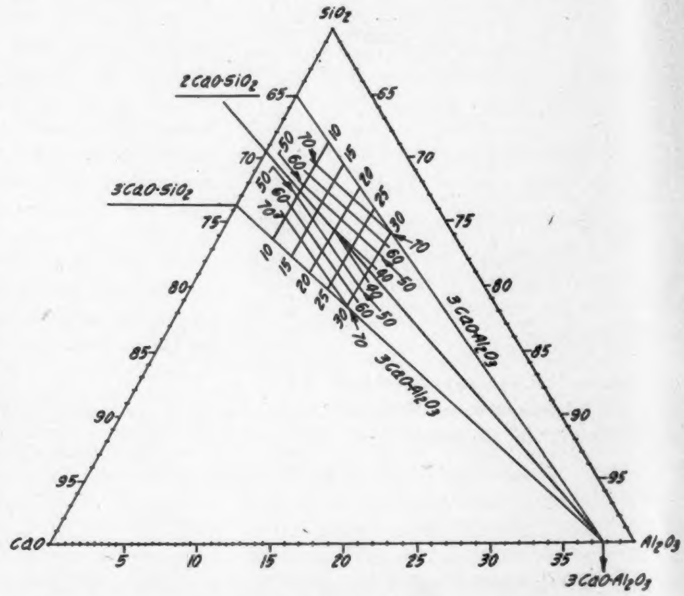


Fig. 2. Portion of the complete ternary diagram used for rapid calculation of approximate composition of cement

In order to calculate the complete analysis, it will be necessary to convert any Fe_2O_3 into terms of Al_2O_3 by multiplying as shown above by 0.7. Add this result to the per cent of Al_2O_3 present and multiply by 1.7. (This shows the amount of lime that is required to combine with the alumina to form tri-calcium aluminate.) Add this to the sum of the alumina and converted Fe_2O_3 and report as tri-calcium aluminate ($3CaO \cdot Al_2O_3$).

Example—

$$(Al_2O_3 + Fe_2O_3 \times 0.7) \times 1.7 + (Al_2O_3 + Fe_2O_3 \times 0.7) = (3CaO \cdot Al_2O_3)$$

Substituting— $(5.9 + 2.3 \times 0.7) \times 1.7 + (5.9 + 2.3 \times 0.7) = (20.28)$

*Wm. A. Ernst, Chief Chemist, South Dakota State Cement Plant, Rapid City, S. D.
†E. S. Ernst, Chief Chemist, Dewey Portland Cement Co., Davenport, Iowa.
‡W. S. Ernst, Chief Chemist, Cumberland Portland Cement Co., Cowan, Tenn.

Any SO_3 present is calculated to $CaSO_4$ by multiplying the per cent SO_3 by 0.7. Add this to the per cent of SO_3 and report as $CaSO_4$.

Example—

$$(SO_3 \times 0.7) + (\%\ SO_3) = CaSO_4$$

Substituting—

$$(1.7 \times 0.7) + (1.7) = 2.89$$

Any free lime and loss on ignition are also added at this point, making a certain total, exclusive of the silicates. In this particular case the total is:

Free lime	....
$3CaO{\cdot}Al_2O_3$	20.28
$CaSO_4$	2.89
Loss on ignition	1.20
Total	24.37

exclusive of the silicates; hence the silicates are 100 — 24.37, or 75.63%. Since, by the graph, we have found the silicates to be composed of 27% di-calcium silicate and 73% tri-calcium silicate, we have:

75.63 × 27, or 20.42% di-calcium silicate
75.63 × 73, or 55.21% tri-calcium silicate
20.28% tri-calcium aluminate
2.89% $CaSO_4$
1.20% loss on ignition

as the complete analysis.

Advantages to the Engineer

A contract may call for the brand of cement to be selected by the engineer. The engineer may have a sample of cement analyzed and in a few moments determine more or less closely the approximate behavior of the cement in use, and whether or not it is suitable for his purpose.

While it takes but very little time to make the above calculations, a shorter process, whereby the approximate composition of a cement can be obtained at a glance, is more desirable, especially where many tests are to be made on incoming consignments of cement.

A method looking towards this end has been devised by W. E. Haskel (3) also, in an article entitled "Commercial Cement and the Phase Diagram." This method makes use of that portion of the complete ternary phase diagram used by Rankin (4) in his studies of the constitution of portland ce-

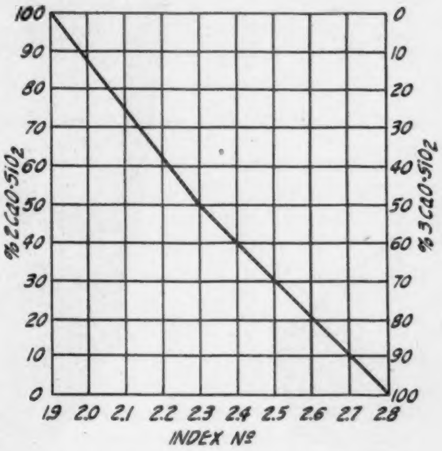


Fig. 1. Graph for determining amounts of di-calcium and tri-calcium silicates

ment, in which the field of portland cement lies. It consists of a small triangle (Fig. 2) showing at the several apices the points representing tri-calcium silicate, di-calcium silicate, and tri-calcium aluminate.

A line drawn from the apex $3CaO{\cdot}Al_2O_3$ to a point of the composition 50% $2CaO{\cdot}SiO_2$ and 50% $3CaO{\cdot}SiO_2$ bisects the angle. Any point above this line has the di-calcium silicate as the predominating phase, and any point below this line predominates in the tri-calcium silicate. To locate a point in this diagram, the ordinary cement

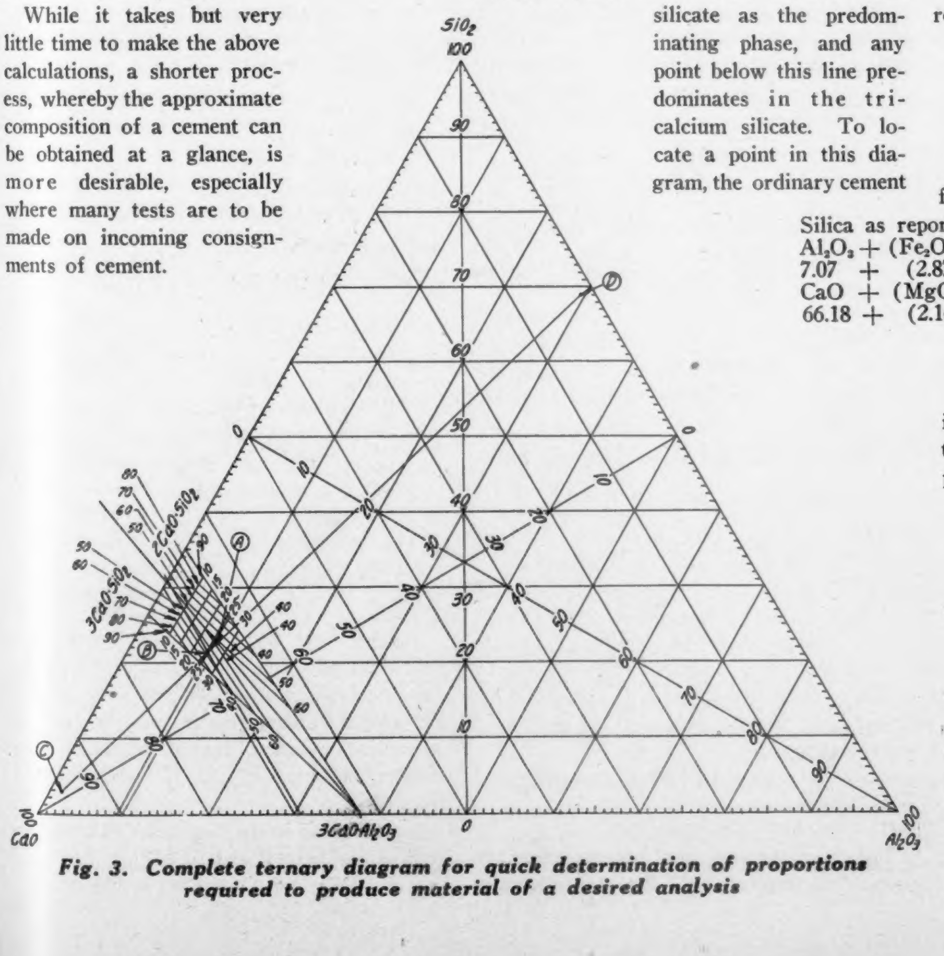


Fig. 3. Complete ternary diagram for quick determination of proportions required to produce material of a desired analysis

analysis (as reported) must be recalculated to a three-component basis and then to 100% after converting any Fe_2O_3 to Al_2O_3 and any MgO to CaO.

After plotting the point the composition of the cement can be read at a glance. This is done as follows: The per cent of silica is reported as found in the analysis. [This and other calculations in this article are based on the assumption that the cement in question has been, or will be, made of well-burned clinker, which has been made from properly prepared raw materials. In other words, the cement shall be given the proper physical treatment. The *silica* referred to is *soluble* or combined silica.] Multiply the percentage of Fe_2O_3 by 0.7, and add this to the percentage of Al_2O_3. Call it all Al_2O_3. Multiply the percentage MgO by 1.4, and add this to the CaO, and call it all CaO. Now reduce the converted analysis to 100% by dividing the percentage of each component by the sum of the three percentages, and plot the point which represents the composition of the cement under consideration.

To do this, locate the point representing the per cent of Al_2O_3 on the $CaO{\cdot}Al_2O_3$ line, measuring away from the CaO apex. Draw a line parallel to the $CaO{\cdot}SiO_2$ line, through this point. Now add the per cent silica and alumina and locate this point on the same $CaO{\cdot}Al_2O_3$ line and join this with a point on the $CaO{\cdot}SiO_2$ line representing the per cent CaO in the converted analysis. The intersection of these two lines will locate the cement in the diagram.

For example, an analysis of cement (as reported) shows:

Silica	21.62%
Al_2O_3	7.07%
Fe_2O_3	2.87%
CaO	66.18%
MgO	2.16%

Calculating this to a three-component basis for the purpose of plotting:

Silica as reported	= Silica	21.62		21.64
$Al_2O_3 + (Fe_2O_3 \times 0.7)$ / $7.07 + (2.87 \times 0.7)$	= Al_2O_3	9.08	÷ 99.90 =	9.09
CaO + (MgO × 1.4) / 66.18 + (2.16 × 1.4)	= CaO	69.20		69.27
		99.90		100.00

Plotting this point in the diagram (Fig. 3), it will be found to fall at (B). A glance at this point will show the cement to be composed of

22.60% di-calcium silicate
52.73% tri-calcium silicate
24.56% tri-calcium aluminate

By a similar calculation, a cement having the composition of

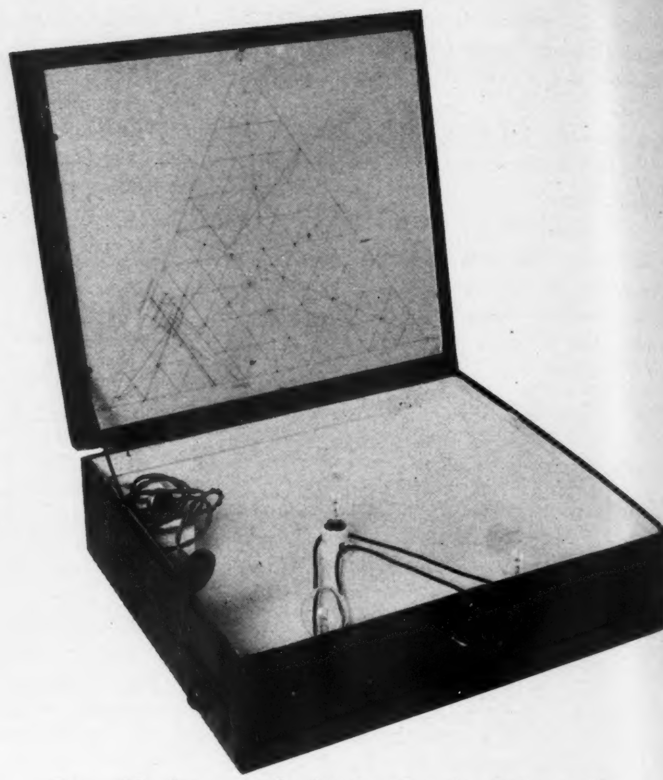
Silica	22.62%
Alumina	7.43%
Fe_2O_3	3.00%
CaO	64.67%
MgO	2.19%

will be found, by plotting this point, to fall at (A), and the cement will be composed of

37.07% di-calcium silicate
37.07% tri-calcium silicate
25.73% tri-calcium aluminate.

A higher early strength may be expected

Specially designed box for use in plotting the analysis



Box with glass raised, showing drawing between the panes and light arrangement in the box

from the cement having the higher content of tri-calcium silicate.

Accordingly, the engineer is enabled to form a better idea of the kind of cement he is buying, and what he can reasonably expect from the concrete made with the cement selected (provided always, that strict attention is paid to the accepted rules for making good concrete as brought out by the water-cement ratio law, and other matters pertaining to the quality of the aggregates, etc.). Uncertainty as to the probable outcome, or the value of a brand of cement, is thereby largely eliminated.

Advantages to Manufacturer of Cement

The authors have combined Mr. Haskell's diagram with their own (Rock Products, October 15, 1927) and have devised a method which is quick and fairly accurate. From this, the chemist, or anyone interested in the probability as to whether or not certain raw materials can be used in the manufacture of portland cement, can get a fair idea of what their proposed materials will produce.

TABLE (1)

	Limestone		Shale	
	Natural	Calcined	Natural	Calcined
SiO_2	1.56%	2.76%	58.00%	65.09%
Al_2O_3	0.38%	0.67%	19.52%	21.90%
Fe_2O_3	0.30%	0.53%	7.38%	8.28%
CaO	53.27%	94.31%	1.14%	1.27%
MgO	0.97%	1.73%	2.82%	3.16%
SO_3	....	....	0.24%	0.26%
Loss	43.04%	....	9.04%	....
N. D.	0.48%	....	1.86%	....

He cannot only ascertain at a glance approximately what proportions will be necessary to use in order to produce a material of any desired analysis, but he can so arrange the desired analysis as to cause it to fall at any point in the small triangle representing all possible analyses in the field of portland cement.

For example, let us take a limestone and a shale having the composition shown in Table (1).

Using R. K. Meade's formula (5), which will produce cement containing equal proportions of di-calcium and tri-calcium silicates:

$$\frac{2.3\times\%SiO_2+1.7\times\%Al_2O_3+\%Fe_2O_3}{\%CaO+(1.4\times\%MgO)-(0.7\times\%SO_3)}=1$$

we would obtain the following results:

LIMESTONE (Calcined Basis)

$$\begin{aligned} 2.76\times2.3 &= 6.348\\ 0.67\times1.7 &= 1.139\\ 0.53\times1.0 &= 0.530\\ \hline & 8.017 = A\\ 94.31\times1.0 &= 94.31\\ 1.73\times1.4 &= 2.42\\ \hline & 96.73 = B \end{aligned}$$

$$B-A=96.73-8.017=88.71=C$$

SHALE (Calcined Basis)

$$\begin{aligned} 65.09\times2.3 &= 149.707\\ 21.90\times1.7 &= 37.230\\ 8.28\times1.0 &= 8.280\\ \hline & 195.217 = A'\\ 1.27\times1.0 &= 1.270\\ 3.16\times1.4 &= 4.424\\ \hline & 5.512 = B' \end{aligned}$$

$$A'-B'=195.217-5.512=189.703=C'$$

$$\frac{C'}{C}=\frac{189.703}{88.71}=2.1385$$ parts limestone to 1 part shale, on a calcined basis.

These proportions can be converted to proportions applicable to the raw materials by dividing them by the percentages of the non-volatile matter in the respective materials. For example:

Non-volatile matter in limestone = 56.48%
Non-volatile matter in shale = 89.10%

Therefore $\frac{2.1385}{0.5648}=3.786$ parts limestone to $\frac{1}{0.8910}=1.122$ parts shale.

This can be further reduced to unity, using the proportion: $3.786:1.122=X:1$, $X=3.374$ parts limestone to 1.000 part shale in the natural condition.

This should give a clinker of the following composition:

CLINKER ANALYSIS

		100% cement-making material
SiO_2	22.62	23.14
Al_2O_3	7.43	10.67 (X)
Fe_2O_3	3.00	
CaO	64.67	66.19
MgO	2.19	
SO_3	0.08	
		100.00

The following ratios will be observed:

$$\frac{SiO_2}{R_2O_3}=2.17 \qquad \frac{CaO}{SiO_2+R_2O_3}=1.957$$

A short cut for locating a desired mix, approximately, in order to ascertain if certain available raw materials will be suitable for manufacturing cement, can be built up by selecting ratios desired in the finished cement, and making the following calculations:

Inasmuch as in the triangular diagram the sum of the percentages of

$$SiO_2+R_2O_3+CaO=100,$$

it will be noticed that by using the following assumed ratios,

$$\frac{SiO_2}{R_2O_3} = 2.17 \text{ and } \frac{CaO}{SiO_2 + R_2O_3} = 1.957,$$

a point representing an approximate mix can be quickly determined. Accordingly, the

$$\begin{aligned} SiO_2 &= 2.17\ R_2O_3 \\ CaO &= 1.957\ (SiO_2 + R_2O_3) \\ &= 1.957\ (3.170\ R_2O_3) \\ &= 6.2037\ R_2O_3 \end{aligned}$$

Therefore, we have

$$6.2037\ R_2O_3 + 2.170\ R_2O_3 + 1\ R_2O_3 = 100\%.$$

From which we obtain the following composition of the clinker on a 100% cement-making ingredient basis:

SiO_2	23.16
R_2O_3	10.67
CaO	66.18

which compares very favorably with the above calculated analysis (X).

Taking the above raw materials and plotting them on the large triangle (all on a calcined basis). Let $C =$ shale, $D =$ limestone.

Assume: An analysis with an index number of 2.3 is selected, and plotted as shown at A (Fig. 3).* Then if a line drawn from C to D passes through A, it is possible to make cement from these two materials, otherwise not, unless a third material is added to make up the deficiency of the needed materials. This feature of a three-component mix was fully shown in a previous article by the authors (6). In the above case, other conditions being equal, the chemist can reasonably expect the resulting cement to be composed of equal parts of di-calcium and tri-calcium silicates, when the limestone and shale are combined in the ratio existing between the lengths of the lines AD and AC, that is:

Limestone : Shale $= AD : AC$.

If it is found practicable to raise the index number to 2.5, the point indicating this analysis will fall at B (Fig. 3). It will be seen at a glance that the points A and B are on the same straight line, connecting points C and D. Point B, however, shows a decidedly different composition when viewed in the light of the di-calcium and tri-calcium silicates it contains.

Using the same raw materials for the sake of comparison, a cement made with an index of 2.3 shows a composition of:

INDEX 2.3

37.07% di-calcium silicate
37.07% tri-calcium silicate
25.73% tri-calcium aluminate

*Note: The analysis indicated by the point A is an assumed one, and by no means represents the only one showing an index number of 2.3. It is used simply for the purpose of illustrating the use of the diagram, and with a few minor changes in the explanation, might well have been replaced by several others. Any point on the central line dividing the small triangle into two equal parts shows the same index number. In other words, the point representing this particular index number is not a fixed one, nor are the other index numbers confined to any single point in the diagram. This does not mean that all points representing the same index number indicate cements of the same characteristics, for such is far from the case. Any particular analysis, as in this case, however, is represented by a fixed point.

While an index of 2.5 shows:

INDEX 2.5

22.66% di-calcium silicate
52.73% tri-calcium silicate
24.56% tri-calcium aluminate

Accordingly, it is the duty of the chemist to plot an analysis in the section of the phase diagram, which is best suited to the conditions and requirements at his plant, and then mix the raw materials in such proportions as will produce the ideal.

A Device to Facilitate Use of Graph

It is more or less inconvenient to plot points representing numerous analyses on the same sheet of paper, since by doing so the paper soon becomes blurred and inaccurate. To overcome this, the authors developed a novel apparatus as shown in the illustrations.

It consists of a box containing two panes of glass, one on top of the other. The bottom glass is ordinary clear glass, but the top glass is frosted on one side, and is used as a drawing board. A drawing (Fig. 3) is placed between these glasses, a series of electric lights in triangular form being placed underneath. On the side of the box is an attachment for wires which can be connected to any light or wall socket. This causes the drawing to be prominently displayed on the surface of the frosted glass.

Accordingly, points can be easily plotted, lines drawn, and the determination made. When the analysis has served its purpose, the lines can be easily erased without disturbing the guide drawing in any way. This will enable the operator to make any number of tests or to compare an analysis of cement with the accepted ideal which may be permanently fixed in the drawing. With care, the apparatus will last indefinitely.

Where new and untried materials are under consideration as to their availability for cement-making purposes, approximate results are quickly obtained, or in the case of concrete work where many analyses are made daily on consignments of cement, it can be used to advantage.

In the case of raw materials, points representing a desired analysis in the finished cement can be permanently plotted on the drawing; when all that is necessary is to plot the analysis of the raw materials, and draw connecting lines.

The point A representing a desired analysis is shown in Fig. 3. Using the same raw materials, C and D, draw a line connecting both points and passing through A. In order to determine the proportions of the raw materials to use to produce A, measure the segments AC and AD, then take AD parts of C, and AC parts of D. This will produce a cement having an index number of 2.3 and the di- and tri-calcium silicates will be present in the cement in equal proportions. The raw materials must be combined in the proportion of 3.786 parts limestone to 1.122 parts shale (all on a calcined basis), or calculated to unity in their natural condition (as used), will require 3.374 parts limestone to 1 part shale.

By a similar calculation (if it is found desirable to raise the index number to 2.5) the point representing this composition will be found at B and the ratio of the segments will show a proportion of 2.306 parts limestone to 1 part shale (on a calcined basis), or 3.64 parts limestone to 1 part shale in their natural state. It is hoped that the short description and explanation given above will serve to suggest to others the many applications of this method, which have suggested themselves to the authors. It is by no means confined to those which have been outlined.

References

(1) W. E. Haskell, *Concrete,* April, 1927.
(2) R. K. Meade, Rock Products, August, 21, 1926.
(3) W. E. Haskell, *Concrete,* July, 1927.
(4) A. M. Rankin, *A. M. J. Sci.,* 39, 1 (1915).
(5) R. K. Meade, Portland Cement (1926).
(6) E. S., W. S. and Wm. A. Ernst, Rock Products, October 15, 1927.

Bolivia Opens First Cement Factory

According to a recent report, the first cement factory in Bolivia has just been completed and trial operation has commenced. The plant is located at Viacha, about 18 miles distant from La Paz. The installation is modern throughout, the mill having been equipped with machinery made in the United States. A reverbatory, oil-fired kiln is the outstanding feature of the equipment.

Clay is obtained locally, but limestone is brought from Calamarca, a short railroad haul. The finished product is expected to cost approximately $8.25 per bbl. delivered at La Paz. Railway freight from Mollendo to La Paz on cement is $21.50 per ton, and consequently it is expected that the importation of cement into northern Bolivia will no longer be profitable. A local company, with a capital of Bs. 1,000,000 ($375,000) has constructed the factory, but the majority of the shares are held in Peru. At first production will be about 150 bbl. per day, but it is hoped to double this figure, without increasing the machinery, within a year.

Foreign Cement for North Carolina Roads

A cargo of 50,000 bags of foreign cement arrived at Wilmington, N. C., recently. This is said to be the largest cargo ever imported through Wilmington. The shipment is consigned to the North Carolina state highway commission and will be used in road construction work throughout the state. It was the third shipment of Belgian cement received within the last two months. The commission now has orders for several other shiploads.—*Greenboro* (N. C.) *News.*

Trend of Portland and Accelerated Portland Cement Composition*

Gap Between Present Composition and Pure Tri-Calcic Silcate Being Closed by Manufacturing Refinements

By Edwin C. Eckel
Consulting Engineer, Washington, D. C.

IN the first edition of "Cements, Limes and Plasters," published many years ago, I suggested that portland cement is in reality an attempt to reach the composition of the pure tri-calcic silicate—subject, of course, to necessary manufacturing limitations. The idea is now a commonplace, and I am recalling here its early statement merely to give point to what can now be proved to have actually occurred during those twenty years of slow progress. It is a proof that can be made visible, as is done in the accompanying diagram; and aside from its interest as a record of accomplished progress, it seems to me to suggest very strongly the future direction that will be taken in the ~~development of portland and~~ accelerated portland cement.

At the outset it may be well to define one of the terms that has just been used, since there may easily be confusion with regard to it. From my own standpoint I use the term accelerated portland, as covering a cement of pure portland type which has been given new or better developed technical properties (notably high early strength) by extreme care in the selection, mixing, preparation and burning of its raw materials and in the grinding of the clinkered product, without the addition, during mixing, burning, grinding, sacking or use, of any new additional material (gypsum, of course, excepted). The accelerated portlands have come into wide use abroad, some 30 mills being engaged in their manufacture. In the United States progress along the same line seems likely to become equally a feature of the cement industry of the near future. From the engineer's standpoint we may summarize the matter by saying that in early strengths the accelerated portlands compete, to some extent, with the alumina cements. As regards chemical resistance, of course, the alumina cements have as yet no competitor.

As preliminary to consideration of the trend of portland and accelerated portland composition, it will be well to get some idea of the composition fields actually occupied by the three main types of cement now used. This has been done in Fig. 1, where the locations of actual portland, alumina and slag cements are shown by appropriate marks on a triaxial diagram. It will be seen that these fields differ considerably from those indicated as theoretically correct on diagrams that have been used by other writers; but the location shown here correspond to the facts and are supported by some hundreds of analyses of actual cements.

The two points of interest brought out sharply by Fig. 1 are the distance separating alumina cements from the portland and slag cements; and, per contra, the close relationship in location between these last two types. As will be seen later, this last relationship is even now being changed, and the accelerated portlands have moved very far indeed from the neighborhood of the puzzolan field, and also still farther away from the alumina field.

With the general location of the portland composition field thus in mind, we can now profitably consider some of the details which can be shown on a larger scale, as in Fig. 2, where the extreme lower left portion of the triangle is seen.

The black circles in Fig. 2 represent the

*Reprinted from *Engineering News-Record*, April 19, 1928.

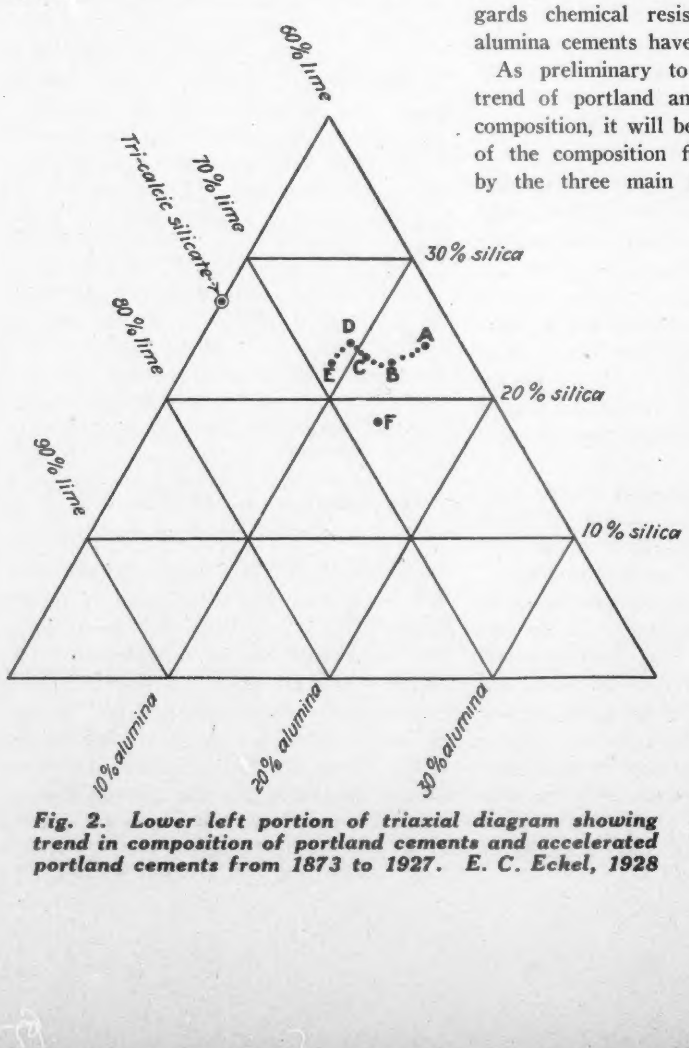


Fig. 2. Lower left portion of triaxial diagram showing trend in composition of portland cements and accelerated portland cements from 1873 to 1927. E. C. Eckel, 1928

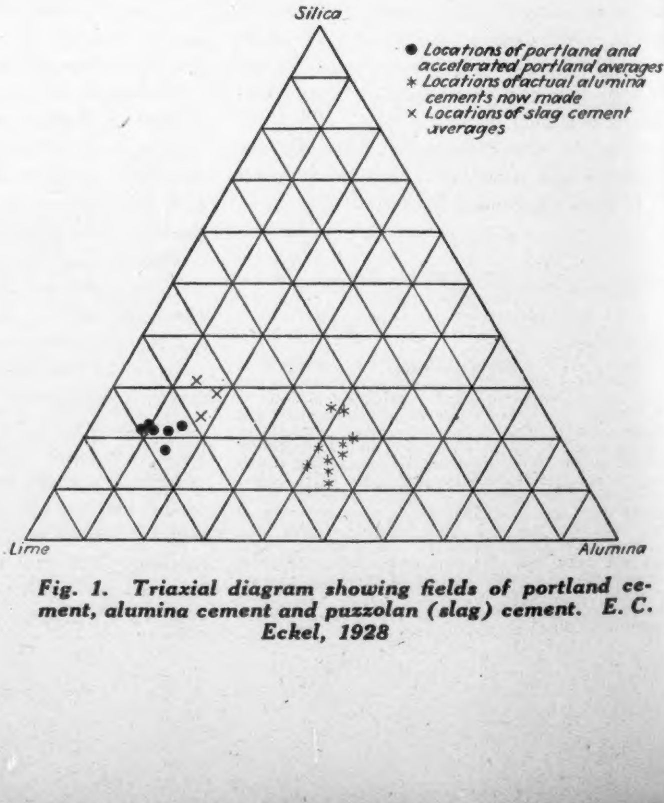


Fig. 1. Triaxial diagram showing fields of portland cement, alumina cement and puzzolan (slag) cement. E. C. Eckel, 1928

location of certain broad averages of portlands and accelerated portlands, made up from data available at different periods from 1873 to the present day. In doing this I have purposely used tabulations that were in existence before I commenced the present study, so as to eliminate the possibility, or the charge, of selecting my data to fit the conclusions. The sources of the various averages used are as follows:

A. Average of three old portlands, made between 1849 and 1873. Tabulated in first edition, "Cements, Limes and Plasters," p. 575.

B. Average of 80 analyses of American portlands as made around 1905. Tabulated in first edition "Cements, Limes and Plasters," pp. 577-579. Averaged by E. C. Blanc for another purpose.

C. Average of 118 German portlands, as made around 1919. Tabulated by C. Naske; averaged by Blanc.

D. Average of thirteen recent (1926-1927) French and Belgian portlands. Tabulated by Blanc ("Le Ciment Portland," 1927); averaged by Eckel.

E. Average of five European accelerated portlands, as made 1926-27. Tabulated by Blanc; averaged by Eckel.

F. Location of one aberrant European accelerated portland. Noted in text below:

So far as concerns the five accelerated portlands whose analyses were used above *E*, it need only be said that they are all well-known and widely used European brands; all good examples of modern accelerated portlands, with nothing forced or spectacular in their properties, but capable of steadily giving compressive test results which at three days are 100% and at a year still 20% higher than those of the so-called "standard" portlands made at the same mill. The aberrant accelerated portland whose location is given as *F* is one of the attempts to gain speed by adding a little alumina to a regular portland mix. It is one possible way of securing an accelerated portland, but not the normal way.

When the diagram is examined in the light of these dates and other data, it can be seen immediately that the trend of portland and now of accelerated portland composition is very plainly marked. It is in the direction of tri-calcic silicate. This point, of course, it can never quite reach, but the dead space between is being gradually covered by the progress of the industry.

There are two other features which cannot be brought out in this diagram, but which suggest possible future developments of serious technical and industrial importance. Both are connected with the high lime content which the better accelerated portlands carry, as against the ordinary portlands.

The first point is that to carry this higher lime *cheaply,* the mill must have a supply of good limestone, as distinct from cement rock. The second point is that to carry the higher lime *safely,* the mill will do well to use a clay or cement rock whose silica-alumina ratio is around 3:1, rather than a raw material with a 2:1 ratio. Both of these factors will in future bear heavily against our oldest cement district, where limestone is dear and the cement rock has a very low silica ratio. Both of them curiously enough, will bear heavily in favor of the oldest of the European cement districts, for the Tournai region of Belgium has ample limestone and a high silica ratio. The limestone requirement does not affect mills using slag as one component of a portland mixture, but the silica ratio does affect them seriously, since normal blast-furnace slags, using ordinary ore and cokes, do not give a high silica ratio.

So out of the new trend of accelerated portland development we are likely to get results of financial as well as technical importance. As for the technical results, those are already so clear in Europe that there is no need of discussing them here. The common European trade practice is to sell an accelerated portland for 25% more per ton than the ordinary portland of the same mill or of the district. Since all the early strengths of the new product, up to six months at least, are more than 25% in excess of portland strengths, the advantage to the engineer and contractor is obvious. He saves not only time but money by using the higher-grade cement. If, as some American mills are already doing, the accelerated portland is sold at the same price as the older product, the advantage to the user is still more obvious. No amount of conservatism in the cement industry can withstand that pressure very long.

Wear Tests of Concrete

WEAR TESTS OF CONCRETE, Bulletin No. 20 of the Kansas State Agricultural College, engineering division, is interesting because of the method of testing it describes and the uniformity of the results obtained. These confirm the results of other wear tests in showing that so far as abrasion is concerned there is no advantage in having the coarse aggregate harder than the mortar. But they bring out more definitely than any other tests that have been widely published the effect of the water cement ratio on wear. One of the photographs which shows the gradual increase of wear with increased water-cement ratios is very convincing.

The method of testing chosen was that of casting the concrete into 9-in. spheres and revolving them in a standard brick rattler. The percentage of wear was determined by weight and the depth of wear in inches calculated by a formula.

The curves relation of water cement ratio and wear are practically straight lines and the relation of compressive strength to wear is a straight line when it is platted on logarithmic paper, so that a simple formula for these relations may be derived, $A = K \div S^n$.

An unusual feature of these tests was the testing of a natural cement and "lumnite" cement as well as portland cement. Replacement of portland cement by natural cement beyond 12½% was found to increase the wear proportionately. Lumnite cement concrete 48 hr. old was found to have the same wear resistance as portland cement concrete 60 d. old.

The inference which might be drawn from the statement concerning the soft limestones tested, that, "these stones are about representative of the coarse aggregates which can be produced economically for use in pavement concrete," is that the authors consider them to be suitable for such concrete. Probably nothing of the sort was intended, for certainly such materials should not be specified from the result of wear tests alone.

C. H. Scholer and Harold Allen, professor and associate professor of applied mechanics, are the authors of the bulletin.

British Book on Building Science

A NEW British book entitled "Building Science," which provides an introduction to the scientific study of everyday building materials, devotes considerable space to elementary physics and chemistry.

The relation of these subjects to building science has been correlated in a manner which makes it possible for the layman to fill in gaps in his knowledge, pertaining to the scientific side of the industry, with a minimum amount of time and effort.

The last half of the book gives a study of materials peculiar to the industry, such as lime, portland cement, gypsum, magnesite cements, asphalts, etc.

The chapter on lime describes lime-burning, types of kilns, kinds of lime, and natural cements. Two chapters deal with the manufacture, testing and physical properties of portland cement. Considerable space is also given to a description of special cements such as slag cement, gas concrete, high-alumina cement, etc.

In the short chapter on gypsum is given its calcination, effect of retarders, and the various products of calcination. The final chapter is devoted to a short description of asphalt and bituminous materials.

The book, which is written in textbook form, contains the laboratory procedure for 66 experiments in conjunction with the subject matter. Also, a set of questions, which is included at the end of each chapter, brings out the important facts of the chapter and serves as a means of review. It is written in plain, non-technical language for the layman.

F. L. Brady, M.Sc., A.I.C., is the author and E. Arnold & Co., London, Eng., are the publishers.

The Manufacture of Gypsum Plasters

Leaves from an Operating Man's Note Book—Part III—Retarders

By W. B. Lenhart
Consulting Chemist and Engineer, Long Beach, Calif.

IN THE FIRST SERIES OF ARTICLES were outlined some of the factors that cause defective plaster, taking that phase of the industry beginning with the crude material through the calcination, hot-pit and storage of the calcined material. This series of articles will deal with a discussion of the remaining operations necessary before plaster is ready for use.

The ground gypsum after calcining is called "stucco" and is the basis of practically all of gypsum plasters. The different gypsum products on the market owe their cementing properties to this ingredient.

The setting time of stucco as it comes from the kettles is usually a matter of minutes. Some gypsite plasters have natural setting times of several hours, probably due to organic colloids in the earthy material. Rock gypsum stuccos, however, set comparatively rapidly.

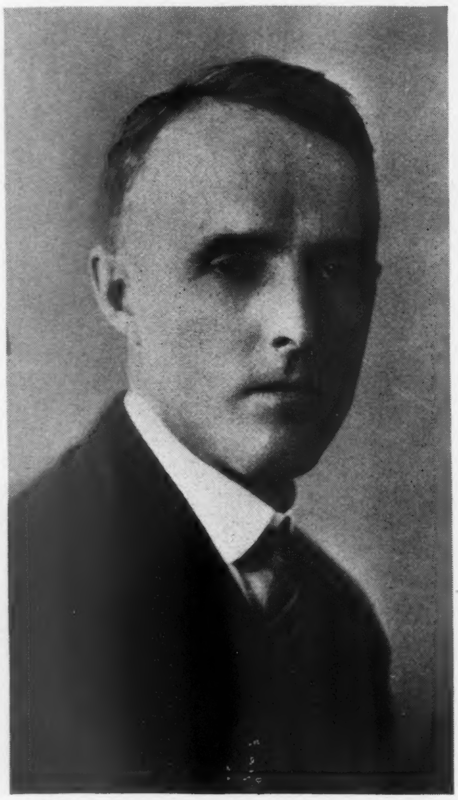
Retarders and Accelerators

In the manufacture of gypsum plasters a product known to the trade as a "retarder" is added to lengthen the setting time to a point which will enable the workman using the product to have sufficient time to thoroughly mix and apply the mortar. In some cases an accelerator is added to speed up the setting reaction, especially where the stucco is used in the manufacture of tile and wallboard.

There are several compounds or chemicals that act as retarders, among them being ammonium citrate, molasses, gelatin and its less aesthetic sister, glue.

The commercial retarder as generally spoken of in the industry is made from hair, hoofs, sinews and connective tendons of animals. These organic materials are treated with caustic soda. Sodium carbonate and lime can be used in place of the refined caustic soda, in which case the combination of the two salts form caustic soda. This alkali reacts with the hair, etc., and forms a glue-like substance, which on evaporation and absorption of the remaining liquid with lime, a hard clinker is obtained. This material is ground to suitable fineness, sacked and in this condition is supplied to the trade.*

The strength of the retarder can be controlled by the manufacturer. Too highly a concentrated product is not desirable nor too weak a concentration. Either of these two points are not so important to the plaster manufacturer as that of uniformity of the retarding elements. Without a uniform and dependable retarder the gypsum plaster business would soon be a dead issue.



W. B. Lenhart

Fortunately the retarders supplied to the trade are remarkably uniform in their strength, and their quality is such that about the last place that one looks for the possible source of defective plaster is in the retarder.

It is well not to take too much for granted, however; and on receipt of a car of retarder several sacks should be taken at random from the car and a mill trial on each sack conducted. The resulting plaster should be carefully sampled and tested to check the comparative strength of the car's content.

The retarder should be stored in such a fashion that the older material will be used first, as long periods of storage tend to the formation of lumps, retarder being slightly hydroscopic. It should be needless to say that the material must be stored in a dry place.

If for any reason the retarder becomes too lumpy for use, it can be worked up readily by breaking the lumps and screening, as no loss in strength of the material is caused by this condition. Actual leaching of the retarder by water will reduce its retarding properties.

Where the retarder is received at the mill in returnable sacks these containers should be cleaned before returning to their source, not only to save freight, but the retarder as well. These cleanings should be saved but not used in the mill with the regular run of retarder. It can be sacked and sent out on the job when a dealer asks for a little of this substance.

Action of Retarder

In the manufacture of glue and gelatin we find the raw materials used practically the same organic materials that are used in the manufacture of retarder.

The first step in the processing of gelatin consists of treating the hide with a saturated solution of lime, which is kept at constant alkalinity by suspensions of the hydrate. This glue stock is composed of collogen, elastin, muscin, kertin and albumins. The first protein, collogen, is found in practically the pure state in the white inner layer of hides; elastin is found in the connective tissues, kertin in the hair and albumin in all of these. The liming operation readily dissolves the albumins and muscin. A stronger alkalinity will dissolve the above two products and the collogen as well. A still stronger alkali will dissolve all of the above products. However, for gelatin only the collogen is desired.

Thus we see that the first step in the manufacture of gelatin and the first step in that of retarder differ only in the strength

Editors' Note

THIS IS THE FIRST of a second series of articles on gypsum products manufacture, the preceding series having appeared in Rock Products of December 10, 1927, and February 4, 1928. The author is a consulting engineer and chemist who has had several years' experience as chemist, superintendent and plant manager of gypsum mills. He is now engaged in private practice and maintains a laboratory for experimental and research work.—The Editor.

*For a more complete description of the process of manufacture of retarder see ROCK PRODUCTS, December 25, 1926, pp. 147-148.

of the alkali of the first operation. Or, in other words, in retarder all of the glue stock is dissolved, while for gelatin only that portion that will give a clear or purer gel is desirable for edible gelatin.

This similarity in the mode of manufacture of gelatin and retarder leads one to look further along these lines for the delayed action of crystallization of gypsum stucco due to retarder. Gelatin, being the classic example of a colloidal substance, leads to the natural assumption that the retarder as well is a substance of that class.

When retarder is treated with an excess of water the retarder does not dissolve to form a clear solution, but forms a murky, opalescent solution that retains this characteristic on filtering. On addition of stucco to this solution there are several possibilities.

One theory is that each particle of the stucco becomes coated with a film of retarder gel, which acts as a "protector," or protective colloid, and that crystallization cannot start until this gel coating has been coagulated.

There are several ways by which this coagulation can be accomplished, for instance, by the addition of an electrolyte. In practice the precipitation of the colloid is accompanied by the disappearance of the alkalinity of the retarder, so there is the theoretical possibility that either the caustic soda itself coagulates the retarder and is itself neutralized, or that the caustic soda combines with the stucco to form a double sulphate of soda and lime, and thus neutralized, permits coagulation to proceed. Once that coagulation has started crystallization can follow.

Other factors that can cause this coagulation are the time element itself, pressure, heat and dilution.

There are many instances in colloidal chemistry where the addition of a protective gel either prevents or retards precipitation and crystallization or has marked effect on the size of the crystals formed.

One example is in the sugar industry, where crystallization of the sugar crystal is prevented by the presence of molasses. In the manufacture of ice cream gelatin acts as a protective colloid and prevents the formation of any but extremely small ice crystals. In the electrolytic refining of lead the addition of glue to the electrolyte causes the lead to deposit in compact crystal masses, and here this property has proven the very life of the electrolytic lead refining.

In the laboratory there are many instances where a protective colloid either prevents or retards precipitation.

A second theory is that crystallization starts from one or more points throughout the mass and that these points or nuclei are protected by the colloidal material, and that coagulation can be accomplished in all the manners above outlined and in addition the velocity can be increased by the addition of material containing more nuclei, such as crystals of raw gypsum themselves.

Here we have a condition which finds a similar one in the sugar industry where the addition of nuclei or sugar crystals starts the sugar crystals forming.

It is interesting to note that the retarder is not destroyed by the setting process, but probably remains as such in precipitated form and that by recalcining the retarded stucco the colloidal material is reformed.

Recalcining also breaks up the theoretical soda-lime sulphate, reforming the original alkali in the retarder.

The operation of setting and recalcining can be repeated indefinitely without serious loss in the strength of the retarder. A slight loss is suffered due to heating of the retarder above its critical temperature, and there are losses from mechanical sources.

Amount of Retarder Used

The amount of retarder added to the stucco will depend upon several factors. The first is the ultimate use to which the finished product is to be put, and, secondly, the amount will vary with the different crude gypsums used as a source of the stucco.

The following table will give some idea as to the small amount necessary to get a desired setting time.

This table was the result of an investigation on western rock, and the amount of retarder checked very closely with similar tables based on investigation of four different western rock gypsum operations.

The retarder used was purchased from the National Retarder Co. of Chicago. The stucco was freshly calcined, 70 c.c. water to 100 grams of stucco was the proportions for mortar production. Where 5½ lb. of retarder or more were added the pat was set in a saucer and kept moist with water throughout the test to prevent "dry-outs."

TABLE OF EFFECT OF VARIOUS AMOUNTS OF RETARDER ON TIME OF SET

Stucco set "as is"	30 min.
1 lb. retarder per ton	55 min.
1½ lb. retarder per ton	1 hr. 33 min.
2 lb. retarder per ton	2 hr. 17 min.
2¼ lb. retarder per ton	3 hr. 10 min.
2½ lb. retarder per ton	3 hr. 20 min.
2¾ lb. retarder per ton	4 hr. 38 min.
3 lb. retarder per ton	5 hr. 8 min.
3¼ lb. retarder per ton	5 hr. 38 min.
3½ lb. retarder per ton	7 hr. 15 min.
3¾ lb. retarder per ton	7 hr. 27 min.
4 lb. retarder per ton	12 hr.*
4½ lb. retarder per ton	14 hr.
5 lb. retarder per ton	15 hr.
6 lb. retarder per ton	24 hr.
7 lb. retarder per ton	38 hr.
8 lb. retarder per ton	43 hr.
9 lb. retarder per ton	72 hr.
10 lb. retarder per ton	84 hr.
25 lb. retarder per ton	Not set after 192 hr.
50 lb. retarder per ton	Not set after 192 hr.

**Note.* Setting times of 12 hours or more do not give sharp end points to the setting time; and in these cases the setting time is taken at that point when the inside of the pat was hard, but the outer surface still had a scum of unset plaster.

When sand is added to retarded plasters as in practice, the setting times will be materially reduced, depending upon the amount and kind of sand used, method of mixing and other local conditions.

(To be continued)

Determining Surface Areas of Powdered Materials

A PROBLEM interesting to all the rock products industries is that of determining the size of fine particles and many research men are developing methods of measuring sizes of particles in the microscopic field. But it is perhaps surface area rather than diameter that is needed, and measuring surface is at least as important as measuring lineal dimensions. In fact the problems of grinding could not be understood until a method of measuring the surface areas created was developed.

A method of measuring surface area developed in the chemical engineering laboratory of the University of West Virginia has been described by W. A. Koehler in the *Journal of the American Ceramic Society*. It consists in treating the powdered mineral with a solution of a radio-active material. This it has been found will be adsorbed in proportion to the surface exposed.

Thorium B is the compound chosen and it is combined with the material by shaking in a tube or flask. The time element is important and a curve has been prepared showing the time when adsorption practically ceases with any particular substance. Then the sample is centrifuged until all solids are settled and an aliquot part of the solution is drawn off with a pipette, evaporated and tested with a Lind alpha-ray electroscope against a blank. The loss of radio activity is a measure of the adsorption and hence of the surface area of all the particles in the sample.

The original article says that adsorption curves have been prepared for a number of organic and inorganic substances, among which are silica and portland cement. Alcohol was used with substances affected by water.

American Road Builders Association Adds City Officials Division

THE directors of the American Road Builders Association, acting upon the request of several city officials, authorized the formation of a city officials division. The division will be governed by its own constitution and by-laws and will elect its own officers.

The policy of the division for the present will be to apply itself to the street and highway problems of cities.

The organization meeting for the division will be held the early part of June at the headquarters in Washington, D. C.

Rate of Absorption of Limestone

By Herbert F. Kriege, Ph. D.
In Charge of Tests, France Stone Co. Laboratories, Toledo, Ohio

SINCE THE IMPORTANCE of the amount of mixing water in concrete batches has been recognized the several factors increasing or decreasing this mixing water are receiving more attention. It has been known for some time that the absorption of mixing water by some of the more porous aggregates changes the consistency of the batch considerably. This is not necessarily an objectional feature since it is now understood that the high strengths obtained from certain concrete mixes in which porous coarse aggregates are used is due to the borrowing or withdrawing of water from the wet batch, only to release it later during the curing of the concrete. In trying to estimate the absorptive capacity of these aggregates the question arises as to the degree of saturation attained before the mass sets sufficiently to prevent further absorption. If the coarse aggregate has an absorption of 2.6% by the A. S. T. M. method (24-hour immersion), how largely will that absorption be satisfied in the first five minutes or first half hour?

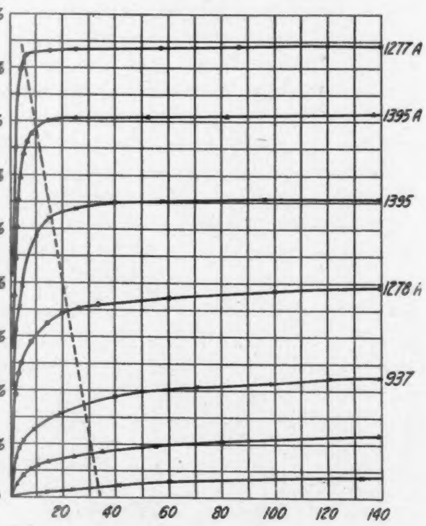
Having a wide variety of porous materials available it was thought worth while to find the answer to this question for some 30 limestones and dolomites covering a range of absorptions from 0.1% to 8.8% by weight. The method used may be briefly outlined. Samples weighing several hundred grams each were dried, cooled in air and weighed to the nearest 0.1 gram. A sample was then placed in a wire basket suspended from the pan of a balance and immersed in water. Weighings were made at frequent intervals on the submerged stone—the absorbed water being measured as decreased buoyancy. It was more satisfactory to place a small weight on the opposite pan and note the time at which the absorption of water counterbalanced the added weight than to try to make a weighing at definite time intervals. The observed rates of absorption shown in the graphs below are quite representative.

TABLE 1—ABSORPTION DATA ON TYPICAL LIMESTONES

Serial No.	Percentage absorption During first 10 minutes	During 24 hours
1277A	8.30%	8.83%
1395A	6.88%	7.47%
1395	4.86%	5.93%
1278A	3.02%	4.25%
937	1.31%	2.73%
506	0.59%	1.72%
523	0.09%	0.72%

Table 1 gives the A. S. T. M. 24-hour absorption values of the materials shown in the graph as well as those after 10 minutes. It will be noted at once that the absorption rates are high, especially with the more highly absorptive stones. As the total absorption increases the break in the rate curve is more pronounced. The sharpest portion of the curve is seen to come most quickly in the stone of greatest absorption. The dotted line joining most of these sharpest portions slopes away rather regularly from the vertical axis as the curves of the less absorptive materials are met. This shows that where the total absorption is low the rate of absorption is also low. The reason for this is apparent—when the absorption or porosity is low the pores are small, few and probably poorly connected and these are filled slowly, while with the more porous stone the pores are either larger or more numerous and interlacing and fill up faster.

It is evident that the rate of absorption of stone of sufficient porosity to be considered at all is high enough to have satisfied 50% to 75% of its total absorptive capacity in 20 minutes or less. With the more porous types ranging from 5% to 8% absorption, over 80% of the total absorption is complete in 10 minutes. Thus there seems to be no other condition possible but that porous aggregates drink their fill of the concrete batch water during the time of mixing and the next few minutes in the conveyor, chute or forms.



Relative absorption of limestones

Water Absorbed in Batching Concrete Mixes

It seemed worth while to determine what difference it made on the absorption to have free water or batch water to take up. Four types of material ranging in absorption from 2.73% to 6.84%, whose rates of absorption in free water had been established, were dried, weighed and used as coarse aggregate in 1:2:4 batches by weight to which water was added at the rate of 7 gal. per sack of cement. The batch was thoroughly mixed by hand. It was noticed that the sand-cement mortar adhered strongly to the porous material and if not removed by the mixing it quickly was desiccated by the stone. At the end of 10 minutes the stone samples were taken out of the batch, quickly freed of most of the adhering matrix by brushing and wiping with a damp cloth and weighed. They were then dried at 110 deg. C. and reweighed, the difference between this dry weight and the original dry weight being the amount of cement and sand which had not been removed. From these data the amount of water obtained was determined.

Table 2 gives the figures found for the several absorptive values.

TABLE 2—WATER ABSORPTION FROM WET CONCRETE BATCH

Serial No.	10 min. in batch	10 min. in water	24 hours in water
919	1.85%	6.64%	6.84%
937	1.09%	1.32%	2.73%
1273D	1.67%	3.38%	5.06%
1281D	1.63%	2.76%	4.88%

These data were obtained with 3-in. pieces of stone. The table shows that the absorption of moisture from a wet batch by the aggregate is not as rapid as in free water, being impeded by the layering out of the cement-sand paste on its surface.

It was realized that the rate at which water from a wet batch could penetrate the pores in the aggregate depended upon the surface exposed to this action. The surfaces of the samples recorded in Table 2 were increased by breaking each 3-in. piece into four or six parts. In the following table are shown the absorption values of these samples reduced in size to correspond to ¾-in. to 1¼-in. ordinarily used. A 10-minute contact with the wet mix was allowed.

TABLE 3—WATER ABSORPTION BY SMALLER STONE

Serial No.	% absorbed in *mix* in 10 minutes	% absorbed in *water* in 10 minutes	% absorbed in *water* in 24 hours
919	5.73%	6.64%	6.84%
937	1.19%	1.32%	2.73%
1273D	3.21%	3.38%	5.06%
1281D	2.75%	2.76%	4.88%

Again the absorption from the wet paste is slower than from free water, but the difference is much less with the smaller sizes of stone. Therefore, it is strongly indicated that the delay is only temporary so that the subtraction of water will continue to almost the capacity of the stone before the concrete has had time to set. Just what this amounts to in terms of removed water can be readily seen from the following figures. Assuming the stone to have an absorption of 2.62%, the total water taken up is $350 \times 2.62\% =$ 9.13 lb. or 1.1 gal. water. If this absorptive process takes places as indicated we may expect the mixing water to be reduced by approximately a gallon before setting begins. This of course will naturally alter the consistency of the wet mass.

Grateful acknowledgement is hereby made to Warren Francke, who collected most of that data presented above.

New Pennsylvania Lime and Hydrate Plant Begins Production

Everett-Saxton Co., Everett, Penn., Mines Its Own Coal

OPERATION was recently begun at the Everett, Penn., lime plant of the Everett-Saxton Co. This plant is designed to produce 30 to 36 tons of lump lime and 75 tons of hydrated lime per 24-hr. day. The quarry is at Ashcon, Bedford county, about two miles west of Everett. Limestone from this locality has been furnished for flux to the iron furnaces at Everett for many years. It is an old limestone (Cambro-Ordovician formation) and varies from 64.75 to 93.014% calcium carbonate in various local deposits, according to the Pennsylvania Geological Survey. The magnesium carbonate content varies from 3.216 to 27.85%. Most of it is dark colored. The Everett-Saxton Co. plant is designed to burn the high calcium stone.

The lime plant consists of three York kilns, 11 ft. in diameter by 50 ft. high, built for hand-firing and natural draft. It is proposed using high volatile coal as a fuel. It is proposed later to convert the plant to gas-firing and provision has been made for the change-over. These kilns each produce

Coal storage bin and elevator, Everett-Saxton Co.'s new lime plant, Everett, Penn.

10 to 12 tons of high-calcium lime per day. In the operation of the kilns two firemen and two shear men are the only help that is required.

Some Cars for Stone and Coal

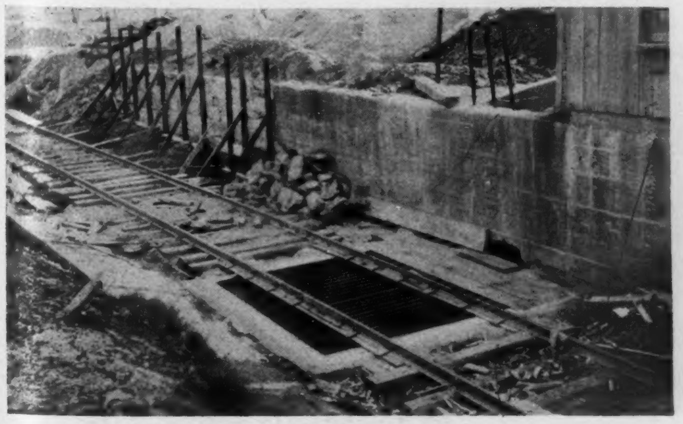
The stone is brought from the quarry on side-dump cars propelled by a gasoline locomotive. At the foot of the incline the cars are attached to a cable operated from a hoist at the top of the kilns. The coal is delivered in railroad cars from the Everett-Saxton Co.'s own mines to a track hopper; there it is discharged into a conveyor, which delivers the coal to an elevator, which in turn delivers it to a 60-ton steel storage bin. The storage bin has a bottom discharge gate set at a height to load the side-dump quarry cars. The coal is taken by the same gasoline locomotive to the foot of the incline; drawn to the top of the kilns just as the same cars are when loaded with stone. At the top of the kilns the coal is dumped into a series of chutes which distribute the coal in front of the firing box of each kiln.

Lime Handling

When the lime is drawn from the kilns it is delivered by an elevator to a storage bin. Provision is made in this storage bin to deliver lump lime for direct shipment by wagon, motor truck or railway; also there is a dis-

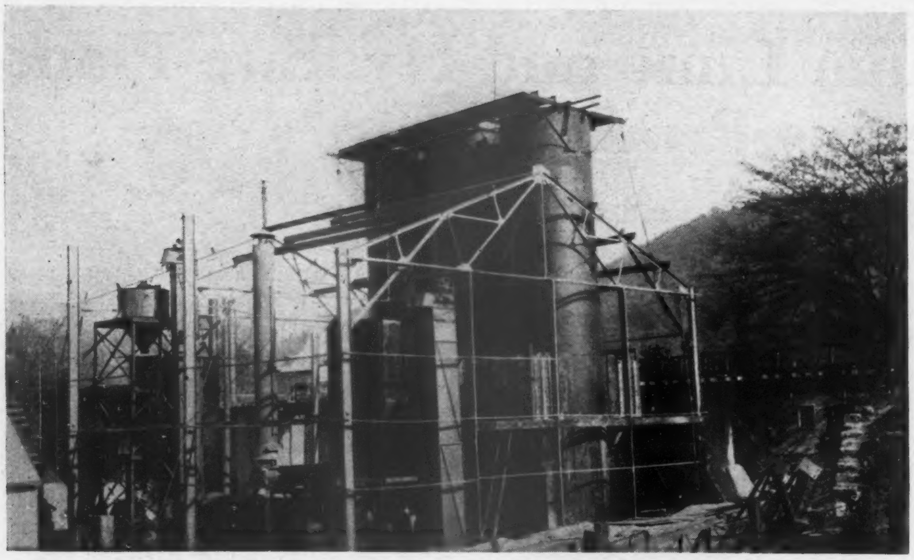
View of completed plant, showing incline from quarry

Completed plant, showing railway trestle in foreground

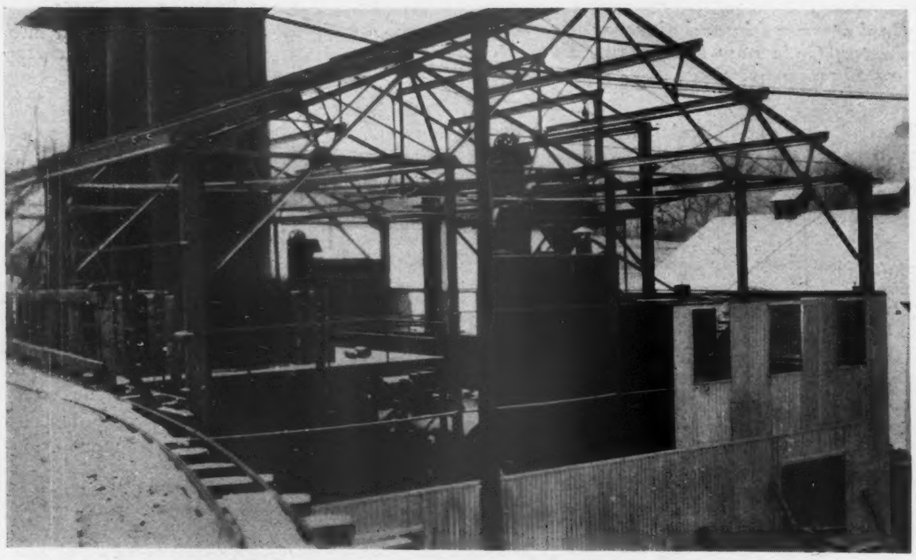


Pit for receiving coal from hopper cars

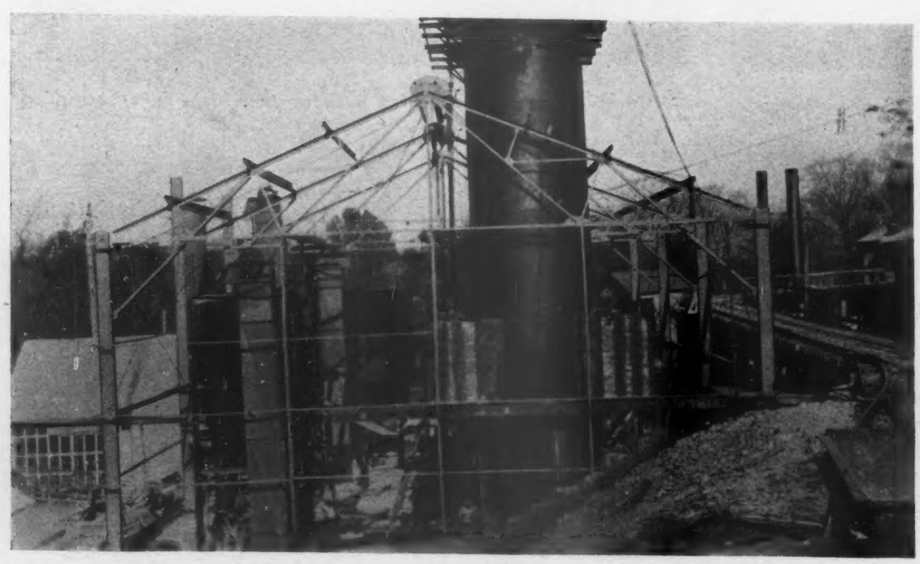
Top of the kilns, hoist house left



Progress view, showing all-steel construction



Progress view, showing building construction details



End view of plant, showing economy in space requirements

charge of lump lime to a "McGanCo" spiral automatic lump-lime feeder, which provides for delivery of the lump lime to a No. 4-C Schulthess hydrator. The discharge of the hydrate from the hydrator is into a steel elevator, which in turn discharges into two separators; one separator provides superfine hydrate and the other chemical or mason's hydrate.

Hydrate Plant

A feature of the hydrate plant is the small amount of power required. The hydrate plant is designed to take care of increased capacity and can produce 75 tons of hydrate lime per day; for this production there is provided 85 hp., distributed through eight motors; the working horsepower is less than 40% of the connected horsepower. The electrical equipment is of the latest design; the remote control system is used, which allows the operator to start and stop all machinery from a central location, where he has a view of all the moving machinery.

The kilns and all of the hydrate machinery are housed in a steel building, the whole being of fireproof construction. The design provides for raw lime and hydrate lime storage, yet the plant is housed all under one roof. It is an example of compactness. The company will specialize in raw lime, lump and pebble sizes; hydrated lime, superfine, chemical mason's and agricultural.

The contract for the design and construction of the complete plant was let to the McGann Manufacturing Co., Inc., York, Penn. It was built in its own shop and erected under its supervision, and was turned over to the owners as an operating unit. The Everett-Saxton Co.'s main offices are located at Everett, Penn. Banks Hudson is general manager; R. E. Harvill is general superintendent.

Solubility of Limestone in Rain Water

IT HAS LONG been recognized that limestone as well as other carbonate rocks are slightly soluble in rain water. Attempts have heretofore been made to compare the solubility of different stone by experiments with weak acid solutions. Experiments are in progress at the Bureau of Standards to determine the rates different types of building stones dissolve when freely exposed to the weather. Two-inch cubes of the stone are carefully weighed in the dry state and placed on the roof of one of the bureau's buildings. At intervals of a year or more they are taken into the laboratory, dried, and weighed. The limestones have shown a loss of weight of such magnitude that it can be determined readily even after one month's exposure to normal summer weather. The sandstones included in the tests indicated a very slight loss during the first two years, and thereafter an increase in weight. It is probable that the loss of weight noted for

sandstone was due to the leaching out of a small amount of soluble matter in the matrix, while the increase resulted from the accumulation of dust which formed on the surface.

From tests on a rather porous oolitic limestone composed mainly of calcium carbonate the loss of weight caused by seven years' exposure to the weather indicates that slightly more than 1 mm. thickness would be dissolved from the exposed face in 100 years. Similar tests on a dense crystalline limestone indicated that the rate of erosion was about one-third less for this type.

The exposure to which these specimens were submitted is evidently much less severe than an urban exposure. The theory of this action on limestone is that rain water becomes slightly acidic from absorption of carbon dioxide and sulphurous gases from the air. Carbon dioxide in the air is more abundant in thickly populated districts and sulphurous gases more abundant in manufacturing districts where there are many smokestacks. The place of exposure of these specimens is such that one might expect relatively low amounts of these gases in the air. For this reason it is proposed to extend the experiments to more severe exposures.

The effect of surface solution on limestone used in buildings is not always undesirable. Some limestones are kept clean and fresh in appearance by this action. Limestones which do not dissolve uniformly and, hence, are left with a rough surface accumulate dirt almost as readily as a sandstone. Carvings or inscriptions on limestone freely exposed to the weather gradually lose their definition because of this action.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Excess Lime Treatment for Hard Water Called Great Advance

JOHN R. BAYLIS, filtration engineer, Bureau of Engineering, Department of Public Works, Chicago, Ill., a leading authority on public water supplies, in a paper presented November 17, 1927, to the American Society for Municipal Improvements, which contains much encouragement for lime manufacturers who will take the time and trouble to develop this market. Speaking of the excess lime treatment and recarbonation he said:

"For waters having a hardness of over about 100 parts per million and containing over about 8 parts per million of magnesium (Mg), it is possible to add lime to the point where most of the magnesium is precipitated as magnesium hydroxide. This appears to be a very powerful coagulating and adsorbing agent, and is effective in removing compounds from the water not easily removed otherwise. Such a treatment leaves the water too alkaline, or perhaps it is better to say with too high a pH for general uses. Carbon dioxide is now being added at a few plants to neutralize the excess alkali, and we should expect its use to be extended to practically all softening plants for public supplies.

"The use of CO_2 probably marks the beginning of a development that will almost revolutionize the treatment of a large number of water supplies. This is especially true for waters high in calcium and magnesium bicarbonate. It is possible with such a treatment to wind up with water in which no chemical constituent has been increased and in which certain constituents have been materially reduced. This is something that cannot be accomplished with the use of any other treatment.

"Recarbonation also allows the water to be taken out of bounds chemically for domestic uses to accomplish a certain purpose, then to bring it back to a suitable chemical balance. The amount of pollution that may be removed by such a treatment appears to be very much greater than when treated with aluminum or ferrous sulfate. It is possible to deliver a pure and palatable water by use of the excess lime treatment and recarbonation when if it was treated otherwise the bacterial content would be so high that excessive chlorine tastes would be produced. The excess lime treatment followed by recarbonation probably marks the greatest advance yet made in the treatment of hard waters."

Top of hydrator unit, showing feeder and condenser

Bottoms of hydrate bins, showing bagging machines

Gravel Company Buys Iowa Land

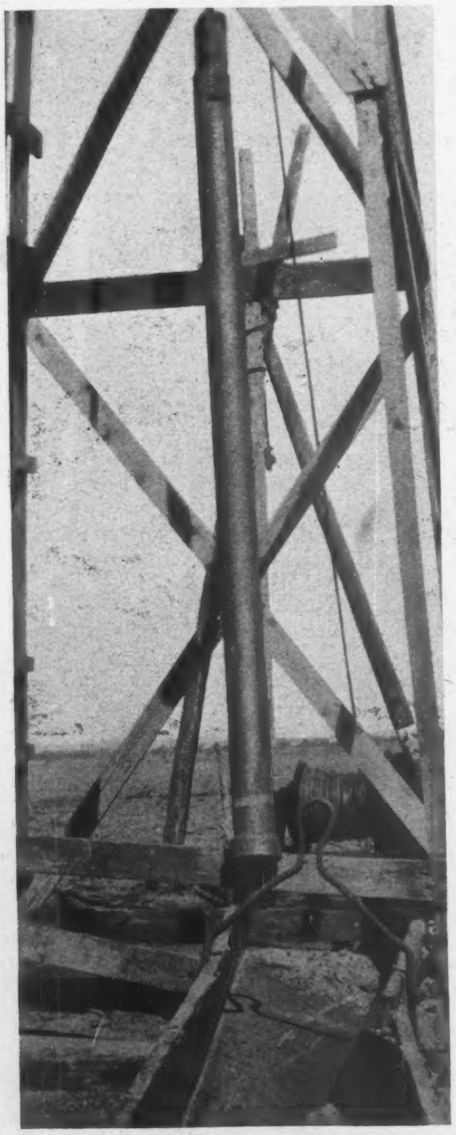
THE M. R. Gibbons Co., Chicago, Ill., recently purchased 50 acres of gravel bearing land in the vicinity of Cherokee, Iowa. The land adjoins the Illinois Central tracks. The gravel deposit has been tested to a depth of 60 ft. and it is estimated that the property contains approximately 4,800,000 cu. yd. of gravel.—*Cherokee* (Iowa) *Times*.

Hints and Helps for Superintendents

Gravel Pumps for Prospecting Deposits

THE prospecting of gravel deposits satisfactorily is always a problem to the producer who is opening new ground, especially if part of the deposit lies below water. In dry deposits an auger works pretty well (with a windlass to pull it) and test pits can be dug at intervals to check the boring and allow the deposit to be examined closely. But where the deposit goes below water other methods must be employed. What might be called the classic method is to use a small clamshell bucket (usually with a 12-in. spread) in a pipe that sinks as the earth is removed.

Another method, which is used quite successfully in prospecting the gravel deposits along the Colorado river in Texas, is shown in the illustrations. The gravel is removed with a gravel pump after water level has been reached.



Gravel pump pulled out and over trough for emptying

The deposits are about 30 ft. deep and the lower 8 ft. or so is below water level. A hole is dug through the dry part just large enough to accommodate an old 48-in. rotary screen jacket, which is used to keep the gravel from falling into the hole. When water is reached the pump comes into play. The pump is a piece of 8-in. pipe with a clack valve in the bottom and a rod and piston above it. It is lowered into the hole and the rod and piston are drawn up causing suction which pulls the gravel and sand up through the valve. The pipe tends to sink at the same time, which aids in filling the pump barrel. When the rod has come to the end of its run it starts to lift the pump and the weight of the gravel pushes the clack valve down. It is prevented from opening out at the bottom by a catch which is held in place by a heavy rubber band on the outside of the pipe (as shown in the cut) which serves as a spring. The pump is swung over a trough and the catch is released so that the valve can swing out and allow the gravel to run out of the pump into the trough. The rod is allowed to descend to make sure that all the gravel and sand runs out, and after the pump is clean the valve is set above the catch so that it will open and the process is repeated. The old screen sinks as the gravel is removed and it may be followed by more screens, placed above, where the ground is deep enough to require them.

A light derrick made of 4x4 and 2x6 pieces is erected for handling the pump and a small portable gasoline hoist is used with it. The hole may be utilized as a well, and that is what was done in the case from which the illustrations were made. The small house at the right of the derrick contains the centrifugal pump and gasoline engine which supplies water to one of the movable plants so much used in the Columbus, Texas, field. The tank is for priming the pump and the shear legs standing by it were used in making the excavation in the dry part of the hole.

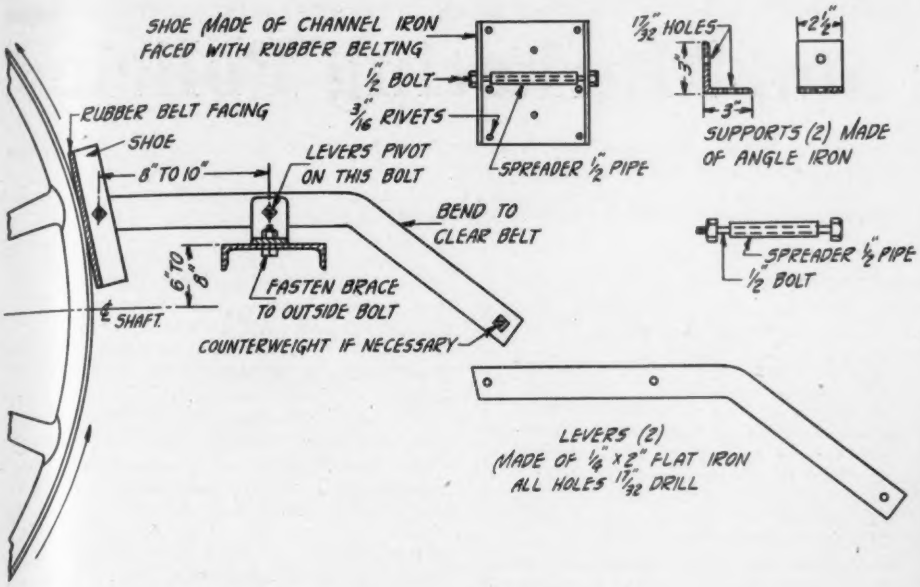
Gravel prospecting rig for use with gravel pump

Mucking Off of Turn Sheets or Platforms

By W. L. HOME
Mining Engineer, Pine Plains, N. Y.

EVERYBODY who has worked in an underground heading and who from necessity or otherwise has manipulated the business end of a shovel in a muck pile knows how much easier it is to shovel from an iron sheet or turn sheets, as they are usually called underground, than from the rough bottom. Yet very few nonmetallic mines have these iron sheets or platforms. The reason for doing without these is usually that they are bent up and broken up so quickly that it does not pay to provide the men with them. This statement is true in just one respect. If the sheets or platforms are not properly put down they will not last long enough to make them worth while but if properly put down and cared for, such is not the case and they can be placed within a very few inches of the face without suffering any unreasonable damage.

When cleaning out a heading do not clean all of the rock. Save especially the finer material which must be shoveled back or to one side and left there until it is time to put down the turn sheet or platform. Then, by using as much of these fines as is necessary level off the place where the sheet is to be placed. Be particular about this because if the platform is resting unevenly on a series of humps and bumps it certainly will be bent up or broken but if the foundation for it is reasonably good and even this will not happen. When the sheet is in place take the balance of the fines and place them around the edges of the plate so that the gas from the explosion to follow will not get under the sheet and raise it as soon as the cut holes are fired. If your platform is on a level bottom and plenty of dirt is left to cover the edges and some for the top of the sheet it will last for a long time. When a man has become accustomed to working this way it will take him but a few minutes longer to do the work properly and he will save both himself and the company by getting the work done quicker and easier. If iron sheets are not available 2x6-in. plank about 6 ft. long are about as good if put down carefully and evenly.



Drawing showing details of home-made hold-back for conveyor or elevator

Hold-Back for Conveyor and Elevators

By CHARLES LABBE
Clarkdale, Ariz.

FOR MOST BELT CONVEYORS or elevators some means must be provided to hold the loaded belt in place in case the motive power stops unexpectedly, also to keep the conveyor from starting backwards and emptying at the tail pulley all the material on the belt.

Such a hold-back must be placed at a convenient point and be independent of hand control when starting again. Ready-made hold-backs for such purpose are often furnished by manufacturers, but not always installed, as to place them at times require some changing or alterations.

The hold-back here described is just as efficient as it is simple to make and can be installed in very little time. It consists of a piece of channel iron, square and nearly the width of the pulley's face. It is slightly curved by hammering down the center and lined with a piece of 6- to 8-ply rubber belting fastened with rivets. This shoe is slightly free to move on the bolt at the end of the holders or levers, which are made of two identical pieces of ¼- or 5/16-in. by 2-in. flat iron, supported at the center by a ½-in. bolt, held by two pieces of 3x3-in. angle-iron, bolted to either a timber of the frame or to a support of angle or T-iron.

Some bracing must be provided for the piece carrying the center, depending wholly upon the installation; an angle brace from either above or below or a strong threaded rod from some convenient point will do.

The shoe part of the lever must be by a trifle the heaviest, so as to just ride the pulley rim, but, however, not so heavy as to cause friction; otherwise some weight must be placed at the extreme end of the lever for this purpose; and to act as a spreader, a piece of shafting drilled through. is used, or washers and nuts on a bolt.

To set the hold-back: The shoe resting on the pulley's rim in the forward running direction the levers must be nearly level and above the center line of the pulley's shaft.

In motion, the light contact will not cause friction on the rim, but should the pulley stop, the shoe being a little heavier than its counterweight, will rest on the rim, and if started backwards it will press hard and bind, forcing a stop. Any forward movement of the pulley will loosen the hold-back.

The best place for a hold-back is on the rim of the largest and fastest revolving pulley, usually at the first counter-shaft from the motor.

A simple semaphore for signaling to an operator out of sight

Railroad Car for Plant Office

AT the Eagle Lake plant of Gemmer and Tanner, Columbus, Texas, an old coach has been purchased from the railroad and made into an office and warehouse. The cut shows the interior of the office with its desk and drawing board and filing cases. Beyond the partition is the warehouse in which almost everything that could be wanted in a hurry is kept.

Interior of an old railway coach used for a plant office

The warehouse is fitted with racks for the accommodation of small parts and a card system is used for keeping a perpetual inventory. Another card warns the clerk, who also attends to shipments of cars and other matters, when stock of any part is low.

Semaphore for Signaling Unseen Operator

OCCASIONALLY it is necessary to signal an operator when it is not possible to see him and where a telephone would not be worth while. This was the case at the Riverside Lime and Stone Co. plant at Lyons, Ill., where the incline to the top of the lime kilns is behind the crushing plant and the tracks at ground level turn at a right angle and pass through a tunnel to the quarry. At the turn in the track a post has been erected which has two semaphore arms mounted upon it. These are connected by wires to a point at the foot of the incline in the quarry. A pull on the wires will raise the opposite ends of the arms, giving a signal which can be plainly seen by the cable operator at the top of the incline. Since there are two arms, a combination of signals for different purposes is possible. The free ends of the arms weigh more than the other ends, so that the arms fall back to a vertical position as soon as the wires are released.

Trade Ethics and Marketing Policies

An Unusual Piece of Publicity for the International Cement Corporation

THE International Cement Corp. and its eleven subsidiary companies are distributing a neatly printed and bound booklet that is an unusual piece of publicity. Instead of advertising the company's product, it gives a full exposition of its policy in both the manufacture and sale.

The keynote is given in a foreword signed by the president, H. Struckmann:

"As a manufacturer, we recognize two fundamental obligations:

"1. To make the best possible product;

"2. To place that product in the hands of the public at the lowest possible cost consistent with the payment of fair wages to our employees, a fair margin to our dealers, and a fair return to our stockholders.

"Over and above these first two is a third obligation which we believe is likewise binding upon us. That is, to carry into daily practice a policy of full publicity, because only by placing the vital facts about our business before the public can we demonstrate the sincerity and the honesty of purpose with which we are discharging our fundamental obligations.

"In keeping with this policy of full publicity we now make public a complete statement of our trade ethics and marketing policies.

"It is our belief that users of 'Lone Star' cement, as well as the trade and general public, will find these of genuine interest."

In the main the book is a compendium of the established policies which doubtless have been adopted at least in part by most if not all of the cement companies of the United States. But the exposition in the book leaves little or nothing ambiguous. It is stated to be the policy of the company to sell only through established dealers and a dealer is strictly defined. The exceptions to the rule of selling through dealers are given fully and at some length. The company's salesmen, it is stated, work only on straight salary.

It is recognized that the dealer must make a reasonable profit to distribute cement efficintly and for that reason established dealers are favored. Extracts from the booklet are:

Editor's Note

WE have made quite copious extracts—although probably all portland cement manufacturers have received or may receive complimentary copies of the original booklet. We have given this SALES POLICY in detail because it CAN BE ADOPTED by any and ALL ROCK PRODUCTS producers and manufacturers with advantage to their own industry and to industry and the public welfare in general. —The Editor.

Sales Direct and Through Dealers

Government and Railroad Business—The United States Government for its own use, railroads (common carriers publishing freight tariffs and recognized as such by State and Interstate Commerce Commissions) for their own use, and state governments which have established a practice of purchasing direct their cement requirements for highway, bridge and other general construction, will be sold direct at the same price and under the same conditions as dealers.

Contractors, Industrial Plants, Etc.—Contractors, industrial plants and other purchasers of cement, when buying one or more carload lots, will be quoted direct but only for the account of, or by the written authority of, a recognized established dealer or dealers in the community in which the cement to be purchased is to be used.

If all dealers in any community refuse to handle an account or if no dealer in the same community has sufficient credit rating to make an acceptable risk on tonnage offered, then we will make direct sale at our list price, as defined later on, to any of the classes of trade mentioned in this paragraph.

Definition and Recognition of a Dealer—A dealer is a person, firm or corporation regularly engaged in selling portland cement and other building materials purchased by him for resale; who maintains a stock of such building materials and is properly equipped with other facilities necessary for serving the trade as a regular dealer in his community.

Combination Dealer—Combination dealer-contractor or a combination dealer-cement products manufacturer is one who, while conforming to the definition of a dealer given above, is also a contractor or products manufacturer. He will be sold as a dealer and at the same price and general terms as any other dealer in the particular community served by his building material supply business. On any purchases for use outside of such community, he classifies as outlined in the paragraph defining contractors, industrial plants, etc.

New Dealers—Every effort will be made to restrict sales to established dealers, as the efficient distribution of cement requires that the dealers handling our product make a satisfactory profit. This is rendered impossible in any given community in which there are too many dealers. This does not mean that we will not accept new dealer accounts in a community which could be better served from the standpoint of distribution of cement by an additional dealer or dealer, but our action will always be in keeping with the paragraph containing the definition of a dealer.

Prices—The company will from time to time establish a base price at its mill. This base price will include the cost of cloth sacks. The base price for cement packed in paper sacks is determined by deducting a differential of 25 cents per bbl. (This differential may from time to time be changed with the fluctuation of the cost of packages.)

The base price for cement in bulk is determined by deducting the charge for cloth sacks and an additional 10 cents per bbl., which will have the effect of making the cost of cement in bulk 10 cents per bbl. below the net (cement only) base price.

To these base prices thus determined must be added transportation cost per barrel as computed by freight or shipping rate from the mill to destination, as shown in rate books provided by the company for this purpose.

This will make the delivered price at any given point, unless a competing mill or mills quote a lower price, in which event we may, under certain conditions, authorize a price to meet such competition.

Expense in direct soliciting for delivery in a distant market having a competitive cement plant within its environs or immediately adjacent, and the excessive cross shipping from one producing section into another, except under extraordinary cinditions, can more properly be considered a waste of revenue than a good business practice and will be avoided.

All prices except government and railroads, as mentioned, will be quoted f.o.b. destination. An exception to this general rule may be necessary when establishing a price for a community immediately adjacent to our mills. In such event the company will, after considering all factors, authorize a price in keeping with the conditions prevailing.

Prices Quoted Railroad and Government—The prices quoted railroads will be on the basis of established price under general rule defining prices, f.o.b. cars at mill or f.o.b. rails of purchaser at nearest junction point, measured by lowest rate from the mill making quotation. (Local freight will be allowed to junction point.) Upon request of the purchaser it will be permissible to have the bill of lading show the final destination on the railroad line making purchase.

The United States Government on direct inquiry will, according to conditions surround their inquiry, be quoted either f.o.b. destination or f.o.b. mill, giving consideration at all times to land grant rate concessions.

States, when purchasing as outlined, will be quoted f.o.b. rail or water at final destination.

The provisions of this paragraph apply only when railroads, United States Government and states make purchase direct. Contractors and others doing railway, government and state work and purchasing their own requirements, will be classified and quoted under provisions of the paragraph defining contractors.

Trade Discount—All classes of trade will be quoted on the same general basis and

prices made up as provided for. Dealers, as described, the United States Government, railroads and state governments on direct purchases under conditions provided, will be allowed a trade, government, railroad or state discount of 10 cents per bbl., which they may deduct from invoices at time of payment.

Cash Discount and Terms—All classes of trade will be allowed a cash discount of 10 cents per bbl. for payment of invoices in full within 15 days from date of issue (with no past due unpaid account), which they may deduct from invoice at the time of payment. All invoices payable 30 days net from date of invoice.

Where large purchases involving daily shipments would inconvenience the customer if daily remittance were required, when customer's credit warrants and where other conditions make it advisable, a plan of bimonthly remittance, based on a 15-day average, can be used.

Trade and cash discount allowance and terms will also be shown on face of invoice.

Dealer Trade Discount—Dealers, to receive or participate in trade discount, will be required to carry the accounts of contractors, industrial plants and others described, and if for reasons as mentioned the cement company is required to carry an account causing a direct sale between the company and the purchaser, the trade discount will be retained by the company. The purchaser will be allowed a cash discount in accordance with the terms and conditions mentioned in the preceding paragraph.

Quotations—Wherever possible quotations will be made on a regular form provided for that purpose. All classes of business except specific work, as described, will be quoted for immediate acceptance (but not to exceed five days) and shipment within 15 days from date of order.

Quotations for Specific Work—For specific jobs requiring delivery of one or more cars of cement as progress of work requires, quotation will be issued giving buyer ten days to indicate his desire for protection thereunder and allowing 30 days in which to receive a valid and *bona fide* award and execute contract for cement required.

Specific contracts with price protection are intended to cover business where a fixed price for finished work has been made and time necessary for completion of such work requires delivery of cement as work progresses.

Specific contracts therefore will be made to cover the cement requirements of all classes of work qualifying with this condition.

By reason of their nature and relation to the market, we will also accept annual contracts subject to sales instructions as to classifications, price and terms, for the requirements of

Railroads.
Street railway lines.
Concrete products manufacturers.
States when purchasing direct.
U. S. Government, on direct purchase by various departments.

Large industrials and public utilities having a well-defined building or improvement program.

A specific contract will be closed only when the buyer has been awarded contract for the work involved; when the owner is the buyer, such specific contract will be closed only when plans and specifications are ready, giving evidence that it has been definitely decided that the work is to be done and the quantity of cement required can be accurately figured. Ten per cent variation in quantity is considered ample if actually required. The price is to be our price current at destination at time of shipment, but not to exceed price shown in original specific contract.

Accurate, Detailed Description Necessary—A specific contract should accurately describe the work covered, state its exact location, and give the full name and address of the owner, contractor or other party doing the work.

Definite Completion Date Necessary—Every specific contract will provide a definite completion date, this date to be agreed upon between the buyer and ourselves before contract is signed. "For delivery during life of work" is indefinite.

Contract Between Dealer and Consumer—If a specific contract is closed through a dealer, our salesman will make every effort to secure signed contracts in triplicate between the dealer and consumer, using the contract forms provided for that purpose. These contract forms include the same conditions found in the contract we sign with the dealer. They thus assure the dealer and contractor that each of them has the same protection in their transaction as the dealer has in his contract with us.

Effort will be made to secure signed contract between the dealer and consumer in every contract made through a dealer, and if our salesman is unsuccessful in doing this, he is expected to so report and state the reasons why.

Estimate Quantities Accurately—In closing a specific contract care will be taken that the quantity stated in the contract is accurate. Our salesman will check the figures not only through the dealer and contractor, but also, when advisable, through the architect, engineer or owner.

Checking Contracts—Our salesman will be furnished with a form covering each contract closed in his territory. It is expected that the salesman will check each uncompleted contract in his territory each time he visits the community in which the work is located. The office will call to the attention of the salesman contracts on which such reports are omitted.

Contract Extensions—Salesmen and branch offices will not extend time of delivery, or increase quantity, or make any other changes after the contract has been entered. All requests for extension or alteration will be referred to the company with detailed explanation of the facts, so that these requests may be given proper consideration.

Quotations, Contracts and Orders—Quotations, contracts and orders, including those delivered to traveling representatives, will be binding on the company only when accepted and acknowledged in writing by our sales manager.

Quotation, contracts and order forms embody under proper captions various conditions that have been found to represent good practice and of mutual interest to seller and buyer. It is, therefore, requested that all read carefully and acquaint themselves thoroughly to prevent misunderstanding. Many of the conditions have had more or less mention in this booklet—but the price, terms and payment captions should have closer study.

Price Change—When conditions make it necessary, change in price will be authorized by the company. Information regarding proposed changes will be so safeguarded as to prevent premature publicity in advance of regular quotation, in order to assure everybody of the same treatment.

In the event of decline in price, quotations will be made effective on date of issue and reduction authorized to apply on all shipments in transit and that have not yet reached destination and been unloaded in customer's warehouse.

Quotations for advance in price will be effective five days from date of notice, during which five days it will be permissible to accept orders for dealers' warehouse requirements for one or more cars for immediate shipment. The amount the customer will be allowed to purchase under this clause will be determined by using the average 15-day warehouse shipments to the dealer for the past six months, fractions of a car to be considered as a full car. In the case of a new account, the extent of the business that may be reasonably expected should govern.

During the five-day period it will be permissible to accept specific work contracts provided the purchaser has a *bona fide* signed contract for such work to be covered, and provided investigation shows such specific work to actually exist and be far enough advanced in plans and letting as to justify making contract. Quotations for other future work will be on the basis of the new price.

If, when tender is received, satisfactory knowledge of the specific work is lacking, acknowledgement will be given by letter, and contract not executed until full investigation of work has been made and satisfactory status determined.

Shipments—Shipments will be in cloth or paper sacks or in bulk, at the option of the purchaser. Sacks will be charged for at our prevailing price and such charges will become a part of the regular invoice furnished the customer. Our present prevailing price on cloth sacks is 10 cents each, and when paper sacks are used a charge of 15 cents per bbl. is made. These charges may be changed from time to time because of fluctuation in the price of packages purchased. Shipments in paper are made at consignee's risk of breakage and resultant loss of cement.

Sacks Returned—Cloth sacks bearing "Lone Star" brand, in which cement has been packed, are to be returnd to our mill, freight collect, handled in accordance with carriers' prevailing rules and so marked as to insure complete identification. For sacks so received in serviceable condition subject to our count and inspection we will allow credit, or make refund at price charged outgoing to original purchaser of cement. We will assume correct freight charges on returned "Lone Star" cloth sacks.

Routing, Claims, Allowances and Diversions—Efforts will always be made to cooperate with buyer in selecting routes by which shipments shall move, rates and service considered. Any terminal or demurrage charges accruing at or after first destination are for the account of the buyer, to be paid for by him.

Claims for loss and damage will be considered only when supported by seal records and railroad agents' acknowledgements on freight bill, which on such claims, as well as claims for overcharge in freight, must be the original receipted document and accompany supporting papers to us.

Change of destination to which shipment is first billed by diversion or stoppage en route will be permitted only by written instructions from the company.

Cancellation—Misrepresentation made in connection with the purchase of the cement, or as the use of the cement for any purpose other than as represented at time of purchase, will be cause for cancellation of undelivered portion of any contract, purchaser remaining liable for unpaid accounts and for all cement delivered prior to such cancellation.

Quality of Cement—"Lone Star" cement is guaranteed when shipped to meet the requirements of the Standard Specifications for Portland Cement as adopted by the United States Government and American Society for Testing Materials. We will not be responsible for improper use of cement, therefore will not guarantee finished work.

Bin Tests—Certain purchasers at times require or request bin-tested cement. In recognition thereof, every facility for obtaining desired samples and for the testing work will be provided at our various plant laboratories with the understanding that the cement is the property of our company and that the testing has not changed the ownership but only approved the quality; therefore if the cement is needed in our usual business, we reserve the right to apply the cement accordingly, without any liability to purchaser or to the testing representative or laboratory having previously accepted the quality as suitable for their client.

Wherever and whenever practicable, without hampering our regular shipments or interfering with our operation, bins may be set aside for this purpose.

Inasmuch as such tests represent an extra precaution or insurance on the part of the purchaser, the purchaser will be required to pay the charges of the commercial laboratory.

Advertising and Entertaining—To keep its product before the public, the company recognizes the advisability of carrying on a reasonable advertising campaign through the medium of magazines, newspapers, novelties and signs.

All advertising and entertaining efforts will be carried on in a dignified and conservative manner. Lavish and extravagant entertaining, gifts, presentation gratis of various articles of commerce that lack the name of the donor, and have for their purpose neither greater nor improved uses of cement, must be considered as a rebate or price concession to influence present or future business, therefore tending to create an undesirable market condition, and will not be tolerated by the company.

Summary—The foregoing outline of the trade ethics and marketing policies of this company is an affirmative statement; it sets forth policies and methods which experience has demonstrated to be in the best interest both of this company and of the public whom we serve; it does not, however, attempt to state what shall *not* be done. That may be briefly and emphatically expressed as follows: Neither this company nor any of its employees will do anything which either directly or indirectly enables one customer to obtain "Lone Star" cement at a lower price or under more favorable terms than other customers of the same class in the same market. We endeavor to make our prices and terms fair to all through the observance and application of the foregoing policies.

Cement Prices

Since trading began, "Price" has been the meeting-point of buyer and seller. Price is the phase of trade negotiation upon which all business primarily turns toward either profit or loss. Therefore, in explaining our price policy, we are discussing the most important, and also the least understood, phase of our business.

There are, however, many well-meaning persons who look with doubt and suspicion upon the trade ethics of any large business. They often conclude, without fair investigation, that price similarity indicates some collusion or artificial obstruction, instead of being the natural result of economic conditions. In the merchandising of cement, the most important of these conditions, contrary to general opinion, is competition.

This company conducts its business independently of any other concern engaged in the manufacture of cement and makes its own prices in competition with other manufacturers in the territory served. We desire, and secure, only a fair and reasonable return on our investment, in keeping with the risks involved.

Quality of the Commodity—By far the most important factor in the merchandising of cement is that all portland cement is manufactured and sold under one standard specification. This standard specification is used by the United States Government, the American Society for Testing Materials, the American Society of Civil Engineers, and all other similar organizations.

This standard specification sets a minimum requirement which must be met or exceeded by all cement, therefore placing all cement on an equal footing with regard to *minimum* quality. While all cement must pass this standard specification, some have physical attributes far in *excess* of the minimum.

We are justly proud of the excellent quality of "Lone Star" cement; but the only premium which the trade pays for higher quality cement is that of good will and continued patronage.

The Market—At all points where "Lone Star" cement is sold, we are constantly in competition with the product of other manufacturers.

The buyer of cement is interested only in the price of the commodity delivered where he wants it. Therefore, when called upon for a quotation, we quote our price for the cement delivered f.o.b. consumer's town.

This practice has developed because of the demands of buyers that they know definitely the cost of cement delivered, and avoid all error and annoyance in computing transportation costs.

Transportation — Transportation charges constitute in excess of 25% of the average delivered price of cement.

Transportation charges, i. e., freight rates, on a given commodity are the same to any and all individuals. Existing rates between known points on any commodity are public information, having been authorized by both state and federal governments, and are published by the railroads.

Freight charges on portland cement from any mill to a given destination are readily determined by any one sufficiently interested to look them up. We, as well as our competitors, can and do ascertain the freight charges against cement from its source to any destination.

From the foregoing it will be apparent that the sale of cement depends upon:

The reputation enjoyed by the manufacturer;

The activity of his organization;

The services rendered to his customer; and

The delivered price of the product.

The Price—The price of "Lone Star" cement is made up of the following:

1. Manufacturing cost, the major parts of which are labor, fuel and supplies; over all of which we have no control;
2. Selling cost;
3. Packing and loading costs;
4. Taxes and depreciation costs; and
5. Reasonable profits on our investments.

The total of these items equals what we term our "base price." This "base price," plus transportation charges, would constitute the delivered price in every market if we had no competition.

The price we actually quote any cement buyer is influenced by two factors:

First—Our "base price," plus the freight charge from our mill to the customer's town; or, Second—Our competitor's "base price," plus the freight charge from his mill to the customer's town.

In the first instance, our "base price" is the *maximum* return which we receive even in those towns which, due to their location, enjoy a lower freight rate from our mill than from our competitor's mill.

In the second instance, as we cannot get more than our competitor's price, we quote a price which *we expect will be identical* with that asked by the competitor whose lower freight rate gives his product the advantage at that point.

As good will and continued patronage are the only premiums the trade will pay for "Lone Star" cement, it is obvious that in order to make a sale, we must meet the lowest *bona fide* price quoted the buyer by any other reputable manufacturer. That is exactly what we do in the second instance!

How do we know what prices our competitors will quote? We never do know; we can only anticipate them. We learn of past quotations in many ways; principally through contact with cement buyers; also from newspapers, trade publications, bids on public work, quotations and sales recently made, and other sources.

It is an easy matter to deduct the known transportation charges and thus determine any competitor's price at point of production. It is equally simple to anticipate the competitor's price at any definite point, just as it is for any competitor to anticipate ours. This usually results in *identical* quotations being submitted by several manufacturers at a given time and place. We do not know of any other industry in which adjustment of the price of its commodity is so automatically fixed by agencies beyond its control.

It must be evident to any fair-minded reader that the lack of free discussion on these points has caused the public to question the genuineness of the intense competition which exists between cement manufacturers. It must also be evident that, regardless of mill cost, the transportation charges on cement are the factors in limiting the trade territory of every mill.

A high transportation charge does not always force this limitation. It frequently happens that in order to get increased business a manufacturer will ship cement to a distant point, absorbing a disadvantage in transportation cost to meet a competing price at that distant point. This naturally nets a very low price; and earns a very small profit, or even causes a loss.

Every mill has, to a certain extent, an advantage over distant mills, in its nearby territory. Unless its "mill base" price is unreasonably high, it can always have some advantage. But if that price is unreasonable, it is an invitation for the invasion of its nearby territory by competing mills.

This whole situation, far from being a detriment to the public, the state and the government, is an economic advantage. This principle was aptly expressed by Thomas Sewall Adams, Professor of Economics at Yale University, when he wrote:

"According to the statistics of earnings (cement) prices have not outrun costs in such a way as to yield dazzling or inordinate profits. . . .The American consuming public stands to gain, not to lose, by the concurrence in every industry of stable prices and moderate profits."

Editorial Comment

Movable Gravel Plants

The movable sand and gravel plant described in this issue of ROCK PRODUCTS is part of a development that is going on in the sand and gravel business. Changing conditions, including exhaustion of deep deposits, have caused operators to look for methods of working shallow deposits without a heavy cost for transporting the bank material to a central washing plant. It was also desired to have a plant that could be moved, perhaps a considerable distance, where the ground work was "patchy." To fill such needs the movable plant has been designed.

It is not to be confounded with the small, cheap, portable plant set up beside the road by a contractor who wants to get out a little sand and gravel for a single job. The movable plant must be a well-designed and very well-constructed machine to serve its purpose. In fact, the earlier plants of the kind fell down because they were too cheaply constructed. But the later plants, carefully designed and built of structural steel, stand up and do good work.

Editorial trips during the past year discovered movable plants working in Eastover, S. C., Muskogee, Okla., and at Columbus, Texas, with others building near Dallas and Fort Worth. All of them were built and operated by large-scale commercial producers, turning out 100 cars a day, or more in the busy season. There is evidently a wide field for plants of this kind, and the next step would seem to be for the machinery houses that build gravel washing machinery to investigate the field and design and build such movable plants.

Industry and Bad Government

It is said that statistics based on tests of recruits during the World War show that nearly half the adult population of the United States has 13-year-old intelligence, or less—that this is the limit to which their intellects are capable of developing. Presumably the men who head important industrial enterprises are in the group having above 13-year-old intelligence, and probably most of them are in the upper 13½% of the population ranked as of "superior intelligence"; otherwise they would not likely be successfully directing the work of others. This is no real reflection on the other groups, for many good and useful persons are not ranked by these tests as of superior intelligence, but they have other equally or more desirable and useful virtues such as industry, honesty, loyalty, honor and patriotism; but to them, good or bad, since they are in the great majority, falls the ultimate responsibility for the success of our democratic form of government.

The trouble with the more intelligent minority groups is they are so busy directing and developing enterprises for selfish reasons, or that the other groups can eat and be clothed, that they fail to take as much interest in government as the necessity for good government demands. They often fail to appreciate how completely their efforts may be nullified by bad government. We have "harped on" this subject before in our editorial columns; but recent events allow us an opportunity to make further comments of a more specific character, showing that there is a very direct relation between the character of a government and the prosperity of these rock products industries.

Recently the supreme court of the state of Illinois declared unconstitutional a 2-cent tax on gasoline sales, thus depriving the public of some $15,000,000 a year for highway improvement. The legality of the tax law was contested by the Chicago Motor Club, not as we understand, because its members are opposed to thus contributing to highway building, but because the law was very loosely and carelessly drawn and not at all equitable in its application; and, also, because the people of the state seriously doubt, apparently, the willingness or ability of the present administration of the state to expend money wisely, efficiently, or even honestly.

The recent primary election in Chicago, Ill., included a referendum on bond issues for public improvements totaling some $72,000,000. They were one and all defeated, not because the people of Chicago do not desire these improvements made, but because, apparently, they were convinced that the present administration of the city of Chicago intended to use a considerable part of the proceeds for political graft. In no city in America is there more local pride in public works, and in no city are public works largely for beautification of the city more popular than in Chicago; yet newspapers and civic organizations advised against these bond issues.

Here then is a specific failure of some $90,000,000 in public works to be undertaken this year, when we all know they are sorely needed, not because they are not wanted, but because the public obviously distrusts the ability or honesty of its elected officials. The result will be hundreds of thousands fewer barrels of cement made in Illinois mills, hundreds of thousands fewer tons of aggregates produced, millions of dollars less pay to thousands of Illinois citizens, fewer luxuries, less comfort, fewer necessities and possible want in many thousand Illinois households. All this might have been prevented if business and industrial leaders would give a fraction of the time they devote to their industrial enterprises to an active interest in good, honest and efficient state and local government.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[37]	12- 5-27	90	92	
Alpha P. C. new com.[2]	4-23-28	38	41	75c qu. Apr. 14
Alpha P. C. pfd.[2]	4-23-28	118	....	1¾% qu. June 15
Am. L. & S. 1st 7's[32]	2-24-28	101¾	102½	
Arundel Corp. new com.	4-25-28	47¼	47¾	50c qu. Apr. 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[18]	4-25-28	107	110	
Atlas P. C. com.[2]	4-21-28	44	47	50c qu. Mar. 1
Atlas P. C. pfd.	4-21-28	44	....	66⅔c qu. Apr. 2
Beaver P. C. 1st 7's	7- 9-27	100	100	
Bessemer L. & C. Class A[11]	4-25-28	36½	38½	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	2-24-28	100¼	....	
Boston S. & G. com.[16]	4-20-28	77¼	80	$1 qu., $1 x. Jan. 2
Boston S. & G. pfd.	4- 7-28	90	....	1¾% qu. Jan. 1
Boston S. & G. 1st pfd.	4- 7-28	95	....	2% qu. Jan. 1
Canada Cement com.	4-20-28	33¼	33½	
Canada Cement pfd.	4-20-28	99⅞	100	1.62½ qu. Mar. 31
Canada Cement 5½'s[43]	4-20-28	102	103	
Canada Cr. St. Corp. 1st 6's[11]	4-21-28	96	99	
Chas. Warner com.	4-23-28	34	36½	50c qu. April 10
Chas. Warner pfd.	4-23-28	108	....	1¾% qu. Jan. 26
Cleveland Stone new st'k	4-25-28	77	79	50c qu. June 1
Consol. Cement 1st 6½'s, A[42]	4-25-28	95	99	
Consol. Cement 6½ notes[24]	4-25-28	94	98	
Consol. Cement pfd.[41]	4-25-28	50	60	
Consumers Rock & Gravel 1st 7's[18]	4-20-28	99½	101½	
Coosa P. C. 1st 6's[32]	12-28-27	65	75	
Coplay Cem. Mfg. 1st 6's[40]	4-20-28	90	....	
Coplay Cem. Com.[40]	4-20-28	12½	....	
Coplay Cem. pfd.[40]	4-20-28	72½	....	
Dewey P. C. 1st 6's[30]	4-25-28	99	101	
Dolese & Shepard[7]	4-25-28	155	....	$2 Apr. 1, $1.50 ex. Apr. 1
Edison P. C. com.[30]	4- 9-28	50c	1½	
Edison P. C. pfd.[30]	4- 9-28	1	3	
Edison P. C. bonds[30]	4- 9-28	75	....	
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.[2]	4-23-28	30	40	
Giant P. C. pfd.[2]	4-23-28	35	45	3½% Dec. 15
Ideal Cement com.	4-25-28	110	113	$1 qu. Apr. 2
Ideal Cement pfd.[33]	4-21-28	110½	111½	$1.75 qu. Apr. 2
Indiana Limestone 6's	4-24-28	98¼	98¼	
International Cem. com.	4-23-28	68⅛	71⅞	$1 qu. Mar. 30
International Cem. pfd.*	4-25-28	110½	111½	1¾% qu. Mar. 30
International Cem bonds 5's	4-25-28	98	98¼	
Kelley Is. L. & T. new st'k	4-24-28	51	53	62½c qu. Apr. 2
Lawrence P. C.[2]	4-23-28	108	112	1½% qu.
Lehigh P. C.	4-23-28	52	54	62½c qu. Jan. 1
Lehigh P. C. pfd.	4-23-28	110	110	
Lyman-Richey S. &. G. 1st 6's, 1931[13]	8-12-27	99½	100	
Lyman Richey S. & G. 1st 6's, 1935[13]	8-12-27	97½	99	
Marblehead Lime 1st 7's[14]	4-20-28	100	....	
Marbleh'd Lime 5½'s,notes[14]	4-20-28	98	....	
Mich. L. & C. com.	4-21-28	35	....	
Mich. L. & C. pfd.[6]	4-21-28	24	27	1¾% qu. July 15
Missouri P. C.	4-25-28	42	43	50c qu. May 1
Monolith P. C. com.[9]	4-19-28	15½	16	8% ann. Jan. 2
Monolith P. C. pfd.[9]	4-19-28	9½	10	
Monolith P. C. units[9]	4-19-28	34½	36	
National Cement 1st 7's[38]	4-21-28	96	99	
National Gypsum com.[25]	4-25-28	15	18	
National Gypsum pfd.[25]	4-25-28	61	64	1¾% qu. Apr. 1
Nazareth Cem.[26]	4-20-28	31	33	75c qu. Apr. 1
Newaygo P. C.[1]	12-30-27	115	....	
Newaygo P. C. 1st 6½'s[23]	2-11-28	120	....	
New Eng. Lime pfd., A[14]	4-20-28	....	95	
New Eng. Lime pfd.,B[22]	4-20-28	97	99	
New Eng. Lime com.[22]	4-20-28	34	36	
New Eng. Lime 1st 6's[14]	4-20-28	98	100	
N. Y. Trap Rock 1st 6's	4-25-28	103	103	
North Amer. Cem. 1st 6½'s	4-25-28	88	90¾	
North Amer. Cem. units[19]	4-23-28	51	54	2 mo. per. at 7%
North Amer. Cem. com.[19]	4-23-28	8	10	
North Amer. Cem. pfd.[19]	4-23-28	47	49	$1.75 qu. Aug. 1
North Shore Mat. 1st 6's[15]	4-25-28	99½	....	
Northwestern States P. C.[37]	11-21-27	165	170	
Pac. Coast Cem. 6's, A	2-17-28	95½	....	
Pacific P. C. new com.	4-21-28	....	24	
Pacific P. C.	4- 5-28	76⅜	80	25c mo.
Pacific P. C. pfd.	4-21-28	....	78	1.62½ qu. Apr. 5
Pacific P. C. notes[5]	3-22-28	99	....	3% s.-a. Oct. 15
Pacific P. C. 6's	4-21-28	....	99	
Peerless Egyp'n P. C. com.[21]	4-20-28	2½	3½	
Peerless Egyp'n P. C. pfd.[21]	4-20-28	90	95	1¾% qu. July 1
Peerless Egyp'n P. C. war.[21]	4-20-28	no market		
Penn-Dixie Cem. 1st 6's[29]	4-25-28	101⅝	102	
Penn-Dixie Cem. pfd.[28]	4-25-28	95	97	1¾% Mar. 15
Penn-Dixie Cem. com.[28]	4-25-28	26½	27	50c April 1
Petoskey P. C.	4-25-28	12½	13½	1½% qu.
Pittsfield L. & S.[31]	10- 8-27	....	100	
Pittsfield L. & S. com.[31]	10- 8-27	....	25	
Riverside P. C.	4-21-28	180	200	50c mo.,$1.50 x. Aug. 1
Rockland-Rockport Lime 1st pfd.[34]	4-20-28	....	100	3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[34]	4-20-28	....	65	3% s.-a. Feb. 1
Rockland Rockport Lime com.[34]	4-20-28	....	50	1½% qu. Nov. 2
Sandusky Cem.	4-24-28	175	175	$2 qu. Apr. 2
Santa Cruz P. C. bonds	4-21-28	105¾	....	6% annual
Santa Cruz P. C. com.	4-21-28	86	....	$1 qu. Apr. 1
Schumacher Wallboard com.	4-21-28	24	24½	
Schumacher Wallboard pfd.	4-21-28	26	26½	
Southwestern P. C. units	4-24-28	275	....	
Superior P. C., A	4-21-28	47½	48	
Superior P. C., B[20]	4-19-28	....	37	
Trinity P. C. units[37]	4-20-28	152	156	
Trinity P. C. com.[37]	4-20-28	52	....	
United Fuel & Sup. 1st 6's[27]	7-14-27	98	100	
United Fuel & Sup. notes[27]	7-14-27	98	100	
U. S. Gypsum com.	4-24-28	74½	74⅞	40c qu. Mar. 31
U. S. Gypsum pfd.	4-24-28	124	....	1¾% qu. Mar. 31
Universal G. & L. com.[3]	4-25-28	2	3	
Universal G. & L. pfd.[3]	4-25-28	....	22	1½% Feb. 15
Universal G. & L., V.T.C.[3]	4-25-28	2	4	
Universal G. & L. 1st 6's[3]	4-25-28	60	70	
Upper Hudson Stone 1st 6's, 1951[32]	12-28-27	92	....	
Vulcanite P. C. 1st 7½'s[32]	12- 5-27	105	109	
Whitehall Cem. Mfg. com.[36]	4- 9-28	150	....	
Whitehall Cem. Mfg. pfd.[36]	4- 9-28	95	....	
Wisconsin L. & C. 1st 6's[15]	4-25-28	100	....	
Wolverine P. C. com.	4-24-28	6¼	6½	15c qu. May 15
Yosemite P. C., A com.	1- 4-28	6	....	

*Will be redeemed on May 20 at $110 and accrued dividends.

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, Chicago, Ill. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal Que.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Asbestos Corp. of Amer., 5 sh. pfd., 5 sh. com.[1]	$1 for the lot	....
Atlanta Shope Brick and Tile Co[1]	25c	....
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	....
Benedict Stone Corp. 1st 7's 1934[8]	....	86
Blue Stone Quarry, 60 sh.[2]	$10¼ for the lot	....
Eastern Brick Corp., 7% cum. pfd.[1]	40c	....
Eastern Brick Corp. (sand lime brick) com.[1]	40c	....
International Portland Cement Co., Ltd., pfd.	30	45
Globe Phosphate Co., $10,000 1st. mtg. bonds, $169.80 per $1000 paid on prin.	$50 for the lot	....
Iroquois S. & G. Co., Ltd., 2 sh. com., 3 sh. pfd.[1]	$12 for the lot	....
Knickerbocker Lime Co.[4]	105	....
Missouri Portland Cement Co., 7% serial bonds	104¾	104¾
Olympic Portland Cement Co.[7]	....	£1⅛
Phosphate Mining Co.[1]	1	....
River Feldspar & Mill'g Co., 50 com., 50 pfd.[1]	$200 for the lot	....
Rockport Granite Co., 1st 6's, 1934	90	....
Simbroco Stone Co.[2]	12	12
Southern Phosphate Co.[6]	1⅛	....
Standard Gypsum Co., 10 sh. pfd., 5 sh. com.[1]	$35 for the lot	....
Tensas Gravel Co., 180 sh. com.[1]	$1 for the lot	....
Tidewater Portland Cement Co., 3000 sh. com.	$6525 for the lot	....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	....
Wabash Portland Cement Co.[1]	60	100
Winchester Brick Co., pfd., sand lime brick[5]	10c	....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston. Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [7]Neidecker and Co., London, England. [8]Auction sale of $1000, Barnes & Lofland, Philadelphia, March 31, 1928.

Arundel Corp. Annual Report

THE annual report of the Arundel Corp. shows a net income of $1,953,640 after charges and federal taxes, equivalent to $3.97 a share on the 491,556 shares (no par value) common stock outstanding. This compares with $1,558,503, or $3.17 per share on the common stock in 1926.

ARUNDEL CORPORATION INCOME ACCOUNT, 1924 TO 1927, INCLUSIVE

	1927	1926	1925	1924
Operating income	$2,241,158	†$1,776,028	$1,567,032	$1,220,971
Provision for federal taxes	287,518	217,525	194,048	157,447
Net income	$1,953,640	$1,558,503	$1,372,984	$1,063,524
Preferred dividends	....	....	....	23,363
Common dividends	1,474,553	983,030	884,722	589,691
Balance, surplus	$479,086	$575,473	$488,262	$450,470
Shares of common outstanding (no par)	491,556	491,555	491,555	*98,310
Earnings per share on common	$3.97	$3.17	$2.79	$10.58

*Shares of $50 par value. †After deducting $126,266 loss on abandonment of plant.

COMPARATIVE BALANCE SHEET, DECEMBER 31

Assets:	1927	1926	Liabilities:	1927	1926
Land, bldgs., mach. eq., etc.	*$3,363,357	$3,716,769	†Common stock	$4,915,556	$4,915,556
Investments	424,087	430,311	Accounts payable	526,398	264,668
Cash	652,695	487,361	Federal taxes	287,518	217,525
Accounts receivable	1,283,494	1,124,288	Dividends payable	737,278	319,485
Notes receivable	1,562,522	526,923	Accrued expenses	65,160	10,489
Market securities	1,062,401	768,886	Reserve for insurance	91,645	80,400
Sundry debtors	58,053	22,809	Surplus	2,128,466	1,649,380
Material and supplies	32,569	29,069			
Deferred charges	312,842	351,087	Total (each side)	$8,752,023	$7,457,502

*After deducting $3,089,158 reserve for depreciation. †Shares of no par value whereof 495,426 shares issued for $4,954,260 less 3,870.4 shares reacquired and held in the treasury $38,704.

North American Stockholders to Vote on Penn-Dixie Merger

HOLDERS of the 6½% sinking fund gold debentures, series "A," of the North American Cement Corp. have been called to a meeting on May 2 at the head office of the National City Bank, 55 Wall St., New York City, to approve the merger and consolidation of the company into the Pennsylvania-Dixie Cement Corp.

Bessemer Limestone Earnings

NET PROFITS of the Bessemer Limestone and Cement Corp. for the 11 months ended December 31, last, after interest, depreciation and other charges were $325,112.42, according to an Ernst and Ernst statement, it was announced at the annual meeting of stockholders by President L. A. Beeghly.

There are outstanding 50,000 shares of "A" stock and 100,000 shares of "B." The statement indicates net for the senior stock of $6.50 a share and, after allowing for its cumulative dividend of $3 a share net, of $1.75 a share for the "B" shares, of which there are outstanding 100,000 shares.

The statement showed total earnings, before charges, during the 11 months in which the new company was in possession of the property, of $744,156.89. Net, after depreciation and depletion, was $516,443, and after bond interest and taxes, $325,113. A reserve of $51,000 was set up for United States taxes, which is expected to be ample.

Shipments were large in 1927, perhaps the largest in the history of the company.

President Beeghly stated that Bessemer's market position was strengthened considerably the past year and that the outlook for 1928 is favorable.

"We expect shipments to increase considerably over 1927," he stated. "Prices," he continued, "declined during 1927 from the 1926 level, but your company's production costs were reduced a corresponding amount. Your company had, in 1927, the lowest production costs of any time in its history."

Of the 150,000 shares of "A" and "B" stock, there were represented at the meeting, in person or by proxy, slightly over 134,000 shares. Directors were re-elected as follows: L. A. Beeghly, W. E. Bliss, W. H. Kilcawley, Philip Wick, E. E. Swartswelter, Charles Schmutz, Richard Inglis, H. N. Snyder, R. C. Steese and C. F. Smith.

The officers of the company are L. A. Beeghy, president; W. E. Bliss and Chas. Schmutz, vice-presidents; W. H. Kilcawley, secretary, and G. G. Treat, treasurer.

The Bessemer balance sheet as of December 31, last, as signed by Secretary Kilcawley is shown in the table below.

BESSEMER LIMESTONE AND CEMENT CORP.

ASSETS

Cash and government securities			$ 310,667.77	
Accounts and bills receivable		$ 310,870.95		
Less accrued for D. accounts and discounts		25,720.19	285,150.76	
Inventories			650,989.63	
				1,246,808.16
Special—				
Advanced stripping			338,611.03	
Advanced royalties			202,745.92	
				541,356.95
Investments				161,967.06
Deferred accounts				80,916.67
Property—				
Limestone reserves and real estate		840,385.22		
Less depletion on limestone		12,321.65	828,063.57	
Plant and equipment		4,413,667.07		
Less deprecation		211,895.44	4,201,771.63	
				5,029,835.20
				$7,060,884.04

LIABILITIES

Current and accrued				
Accounts payable			82,543.62	
Taxes—federal and state			56,363.15	
Dividends and interest			105,187.68	
				244,094.45
Long term obligations				
First mortgage 6½% bonds				2,472,000.00
Capital				
Class "A" stock, 50,000 shares			1,500,000.00	
Class "B" stock, 100,000 shares			2,000,000.00	
				3,500,000.00
Surplus				
Capital surplus			835,603.07	
Earned surplus		546,827.34		
Less dividends paid and accrued	$316,666.67			
Bond interest paid and accrued	139,282.74			
Loss on equipment disposed of	17,846.02			
Accrued for federal taxes	51,000.00			
Pro rata organization and appraisal expense	12,845.38	537,640.82	9,186.52	844,789.59
				$7,060,884.04

Dominion Trap Rock Common Stock Offered

GRIER INVESTMENT CO., LTD., of Montreal, Canada, are offering 20,000 shares (par value $25) of Class "A" common stock of the Dominion Trap Rock Co., Ltd. The Class "A" stock is entitled to dividends at the rate of $3 a share per annum before any dividend is paid on Class "B" stock. After "B" stock is on an equal $3 basis "A" and "B" stocks participate equally in further dividends from then on. The Class "A" stock is callable as a whole or in part on 30 days' notice at $50 per share or the holders of the Class "A" stock called have the option of exchanging their shares for an equal amount of Class "B" shares. The company cannot voluntarily be liquidated unless the Class "A" stock shall be called for redemption as above. In the event of involuntary liquidation Class "B" does not participate in the liquidation of the assets until Class "A" stock has received $50 per share. Class "A" and "B" shares both carry equal voting privileges. The Montreal Trust Co. is named as the transfer agent and the registrar is the Empire Trust Co.

The following data are from the statement of the Grier company:

CAPITALIZATION

	Authorized	Issued
Common stock, $25 par value, Class "A" (this issue)	20,000 shs.	20,000 shs.
Common stock, no par value, Class "B"	50,000 shs.	30,000 shs.

Business—Dominion Trap Co., Ltd., has been incorporated under the laws of the Dominion of Canada to take over the properties, plant and equipment of Bruce Mines Trap Rock Co., Ltd., Bruce Mines, Ontario, located on the north shore of Lake Huron, about 30 miles east of Sault Ste. Marie, Canada.

Product—Trap rock, which owing to its hardness, high resistance to wear, toughness and good cement qualities, is recognized by authorities as one of the most efficient and economical rocks available in America for road-building. Roads constructed with Bruce Mines trap rock in Cleveland and other cities have been in use for over 15 years and records show that under modern traffic conditions roads made with trap rock outwear those made with any other type of stone. Trap rock is, therefore, being specified for road construction. It is, however, still a scarce commodity owing to the very limited deposits which can be handled by water transportation.

Assets—Grier Investment Co. engineers, together with government reports, place the quantity of trap rock available in the company's quarries in excess of 70,000,000 tons. The Canadian Appraisal Co.'s valuation as of January 25, 1928, shows the replacement value of the present plant (exclusive of trap rock deposits) at $659,260.38.

Production—The present plant acquired by the company is capable of a production of approximately 400,000 tons per annum. The company is financed on a basis that will enable it to increase its production to over 600,000 tons per annum.

Contracts and Prospects—The company has closed a contract for sale and delivery of 1,000,000 tons with an option to sell and deliver an additional 500,000 tons at the rate of 200,000 to 300,000 tons per annum, on a basis estimated to yield a profit of 50 cents a ton. In addition to the above contract, the company has numerous inquiries from railroads, contractors and municipalities where experience has shown that trap rock is the most suitable and economical material available for their particular requirements.

Transportation—The company's quarries being immediately adjacent to its own docks on deep water, is in a position to ship by water direct to any of the following markets: Chicago, Milwaukee, Detroit, Sandusky, Lorain, Buffalo, Cleveland and all other Great Lakes ports, both Canadian and American. Trap rock enters the United States free of duty.

Management—Arrangements have been completed which will place the management of the company in the hands of experienced operators who will have the assistance of the following board of directors: A. A. MacKay, Ernest Rossiter, Gordon W. Scott, J. A. Raymond and C. B. Grier.

Keystone Sand and Supply Co. Bond Issue

THE KEYSTONE SAND AND SUPPLY CO., Pittsburgh, Penn., through the Bank of Pittsburgh, National Association, is offering $1,200,000 of 6% sinking fund, gold debenture bonds at 100 and interest. The bonds are dated March 1, 1928; due March 1, 1943, in denominations of $1,000 and $500. Principal and interest are payable at Bank of Pittsburgh, National Association, Pittsburgh, Penn., trustee. Interest is payable March and September without deduction of normal federal income tax up to 2%. Redeemable all or part on any interest date upon 60 days' notice at 105 and interest if redeemed on or before March 1, 1933; thereafter at 103 and interest on or before March 1, 1938; thereafter at 101 and interest on or before March 1, 1943. Free of Pennsylvania 4-mill tax.

Data from Letter of Alex W. Dann, Vice-President and General Manager

Company.—Incorporated in 1902 and for seven years engaged in the purchase and sale of sand and gravel. In 1909 production of sand and gravel was begun by dredging from the Ohio river, and production in that year amounted to about 400 cars. Since that time the growth of the business has been steady and annual production is now about 76 times that of 1909. Distributing plants either owned by the company or associate companies are located at Freedom, Leetsdale, Neville Island, Groveton, Pittsburgh (2), Munhall, McKeesport and Charleroi, Penn. Company owns 14 islands near its markets which provide reserves of sand and gravel for many years. Company at present owns, free of all liens, 3 large dredges, 64 barges and 3 towboats, all of modern design and of steel construction. No wooden floating equipment is owned. The company's distributing plants are advantageously located.

Earnings.—Company's net earnings for the past five years ending December 31, 1927, after depreciation but before taxes, have averaged $236,340, or 3¾ times the interest requirements on this issue of bonds. Such net earnings for the year 1927 were more than 5½ times these requirements.

Purpose.—Proceeds will be used for the payment of all of the company's indebtedness, except current accounts, and for the further expansion of the company's business.

Sinking Fund.—A minimum sinking fund of $100,000 per annum beginning March 1, 1932, will retire this issue of bonds by maturity. As an additional sinking fund the company will pay to the trustee 50% of its net earnings in excess of $400,000 in any one calendar year.

Earnings.—Consolidated earnings of the Keystone Sand and Supply Co., after depreciation, have been as follows:

Year ended December 31	Net earnings after depreciation available for interest and federal taxes
1923	$139,508.74
1924	95,513.90
1925	262,974.18
1926	275,996.63
1927	407,706.69

Provisions of Issue.—These debenture bonds are a direct obligation of the company and are issued under a trust agreement, which will, among other things, provide that so long as any of these debenture bonds are outstanding and unpaid, the company will not create nor permit to exist any mortgage or other secured indebtedness upon the property or properties owned by the company or any subsidiary company, except purchase money mortgages and equipment trust certificates on hereafter acquired properties. The company further agrees that cash dividends shall only be declared and paid out of earnings subsequent to July 1, 1927.

CONSOLIDATED BALANCE SHEET

The consolidated balance sheet of the company as of December 31, 1927, after giving effect to this financing and the reappraisal of the company's properties, is as follows:

ASSETS		
CURRENT ASSETS		
Cash	$704,306.78	
Accounts receivable	143,849.40	
Notes receivable	25,576.10	
Inventories, merchandise	51,176.60	$924,908.88
INVESTMENTS		
Stock of Charleroi Supply Co., at cost	$36,766.67	
Other investments	10,000.00	46,766.67
FIXED ASSETS		
Land, plants and equipment as appraised by the American Appraisal Co. as of Jan. 1, 1928		3,067,700.00
DEFERRED CHARGES		104,313.58
TOTAL ASSETS		$4,143,689.13
LIABILITIES		
CURRENT LIABILITIES		
Accounts payable	$137,355.74	
Accrued expenses	8,337.55	
Dividend payable	37,500.00	$183,193.29
6% sinking fund gold debenture bonds (this issue)		$1,200,000.00
RESERVE FOR FEDERAL INCOME TAX. 1927		49,494.56
CAPITAL STOCK		1,250,000.00
SURPLUS		
Surplus earned	$459,288.56	
Surplus by appreciation	1,001,712.72	1,461,001.28
TOTAL LIABILITIES		$4,143,689.13

International Cement First Quarter Earnings

THE INTERNATIONAL CEMENT CORP.'S net to surplus for the first quarter of 1928 amounted to $1,067,928.96 as compared with $906,292.17 for the first quarter of 1927. These earnings, after allowing for preferred dividends, are equivalent to $1.60 per share for the 562,500 shares of common stock now outstanding.

	First quarter 1928
Gross sales	$6,719,938.54
Less: Packages, discounts and allowances	1,274,065.74
Net sales	$5,445,872.80
Manufacturing cost exclusive depreciation	$2,732,982.84
Depreciation	400,048.67
	$3,133,031.51
Manufacturing profit	$2,312,841.29
Shipping, selling and administrative expenses	1,013,758.84
Net profit	$1,299,082.45
Less: Interest charges and financial expenses	16,943.87
	$1,282,138.58
Reserves for federal taxes and contingencies	214,209.62
Net to surplus	$1,067,928.96

Recent Dividends Announced

Bessemer Limestone and Cement Corp, Class A (quar.) .75c, May 1

Missouri Portland Cement Co. (quar.) .50c, May 1

Pacific Portland Cement Co., Consol., pfd. (quar.) $1.62½, Apr. 5

Wolverine Portland Cement Co., com. (quar.) .15c, May 15

Mexico to Hold Road Show

THE Mexican government has advised the American Road Builders Association of its intention to hold a road building demonstration and exposition in September and October of this year. It is said that special freight rates will be offered to exhibitors who wish to ship machinery in bond (import free) to the exposition.

Quincy, Ill., City Quarry

THE City Quarry of Quincy, Ill., which was operated under lease by Bauer, Johnson and Co. is not now being operated.

According to the *Quincy Whig* the city council recently repealed the ordinance creating a board of commissioners to manage the quarry. Bower and Johnson's lease ran three years and expired March 15.

Mixed Concrete Business Starts with Banquet

THE Ready Mixed Concrete Corp. of Newark, N. J., held an inaugural banquet at the Newark Athletic Club recently. It was attended by 100 engineers, architects and construction men, according to the *Newark* (N. J.) *Call.*

John P. Callanghan is president of the new company. The concrete will be delivered in trucks with mixer bodies.

Georgia Portland Reported Soon to Build

THE Georgia Portland Cement Co., has placed orders for the machinery for its proposed plant at Sandersville, Ga., and will begin construction soon, according to the *Savannah* (Ga.) *News.*

The same article says that the new plant will make quick-hardening cement. More than 1000 persons are said to be interested in the new plant, stock subscriptions from $200 up having been received.

National Gypsum to Expand Plant

ANNOUNCEMENT was made recently, by Herman N. Butler, of East Tawas, Mich., representative of the National Gypsum Company, that the company plans to expend in the near future half a million dollars in expansions to its plant at National City, Mich., to meet the extraordinary demands which are being made upon the present plant. The expansions will enable the plant to increase its daily output of plaster to 500 tons, its output of plaster-board to 300,000 feet, and will permit the manufacture of insulating material and tile wall board. The National Gypsum Company's plant at National City has now been in operation approximately two years.—*Bay City* (Mich.) *Times.*

Aggregates Scientifically Used in New Mexico Dam

IN building the Toltec dam in the Zuni mountains of New Mexico, far from commercial aggregate plants, limestone was crushed to 2 in. and finer. The crushed stone, crusher screenings and river sand, which was available for only a part of the work were the aggregates used.

It was originally intended, according to an article by A. F. Schramm in the April 19 *Engineering New-Record,* to use a 1:2½:5 mix but a change was made to a design based on the water-cement ratio. Using the charts and curves of the Portland Cement Association mixes were designed: Sand 85% and screenings 15%, 1:4.95:4.36; all sand 1:4.85:5; all screenings, 1:4:4.3. It was found that 15% of fine river sand added to the screenings would greatly increase the workability and sand was trucked 11 miles to provide this percentage.

The grading of the coarse aggregate was poor and there were many long flat pieces. The fineness modulus was 8.12. The screening were also poorly graded and had many long flat pieces and the fineness modulus was 3.57. About 20% passed 100 mesh. The river sand, which was excellently graded, had a fineness modulus of 3.63 with 15% to 20% passing 100 mesh on the unwashed sample but with very little clay.

With such a coarse aggregate it was not surprising that a high sand content was found desirable. The conclusions drawn by the author are: (1) The curves and charts (water-cement ratio method) are not strictly applicable. (2) Workability is a factor of the mortar content of the mix. (3) Oversanding 5% to 10% is very desirable both for workability and for density. (4) The use of 15% of fine rock particles, passing a 100 mesh screen, increased workability, density and imperviousness without loss of strength. (5) Adding 15% of river sand to screenings improved chuting and placing qualities.

Future of Aggregate Industry

PRODUCERS of aggregates are often asked where they will find a market for their product when the building of concrete roads is completed. The answer is that such completion is not in sight and probably never will be. At the rate macadam roads are now being rebuilt with concrete, the replacement in New York state will require about 48 years. In the meantime many trunk lines will be doubled or tripled in width. Many of the early concrete roads already need rebuilding and it is doubtful if those now being built will stand traffic 25 years. It is apparent from these facts that the present rate of construction must be more than doubled to keep the roads passable and that we never will be able to meet the demand for new construction.

We now have over 20,000,000 automobiles and trucks and they are increasing 2,000,000 annually. The owners are demanding more roads, wider roads and better roads. How to meet this demand is the gravest problem of the day.—*"Gravellete," Organ of Empire State Sand and Gravel Producers Association.*

Gypsum Co. Organized to Erect Plant in Montana

THE Montana Gypsum Products Co. has filed articles of incorporation with a capital stock of $250,000 to engage in the mining, processing and marketing of gypsum, its products and by-products. The new manufacturing company has been organized by Dr. L. C. Ford of Lima, E. C. Davis, George W. Craven, Garfield B. Perfer and Alex Walker of Butte.

The company owns the large deposit of gypsum near Lima, Mont., formerly owned by Dr. Ford and his associates. Engineers estimate the amount of gypsum actually in sight, according to an official of the company, at not less than a quarter of a million tons with possibly a million tons to be developed. The gypsum is said to be of a fine grade and valuable for all work requiring a fine grade of plaster, such as dental plaster, partition tiles, gypsum board, etc.

The company will devote its efforts for the present to the mining and crushing of gypsum for agricultural purposes. According to reports the plan of the promoters is to have the Montana Gypsum Products Co. start operations with a 100-ton crushing and sacking plant, later building the plant up to 500 tons per day, and adding the proper machinery to furnish all grades of wall plaster, plaster of Paris, gypsum board, partition and tile.—*Butte* (Mont.) *Miner.*

Value of Florida Limestone

HERMAN GUNTER, Florida state geologist, in an article in *Southern Highways* speaks of the possibilities that lie in the expansion of the limestone products industry in Florida. The whole state is practically underlaid with limstone. Some deposits are almost pure calcium carbonate and the lime made from them is finding a market outside the state on account of its purity. He says that the value of all Florida limestone products in 1913 was $156,589. In 1926 it was $7,177,565.

Concrete Revetments

CONCRETE revetments have been found more economical than the usual willow mats in protecting the faces of levees on the Mississippi river, the cost being $225,000 per mile as against $300,000 per mile for willow mats. The *Tech Engineering News* says that many miles of this protection has already been placed. The general use of concrete for this purpose should add to the demand for cement and aggregate when the flood control program gets under way.

Portland Cement Output in March

Stocks on Hand Highest in History of the Industry—Production and Shipments Fall Behind March, 1927

THE PORTLAND CEMENT INDUSTRY in March, 1928, produced 10,223,000 bbl., shipped 10,135,000 bbl. from the mills, and had in stock at the end of the month 27,436,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in March, 1928, showed a decrease of 10.7% and shipments a decrease of 8.7% as compared with March, 1927. Portland cement stocks at the mills were 14.7% higher than a year ago.

The statistics here presented are compiled from reports for March from all manufacturing plants except two, for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 155 plants at the close of March, 1928, and of 141 plants at the close of March, 1927.

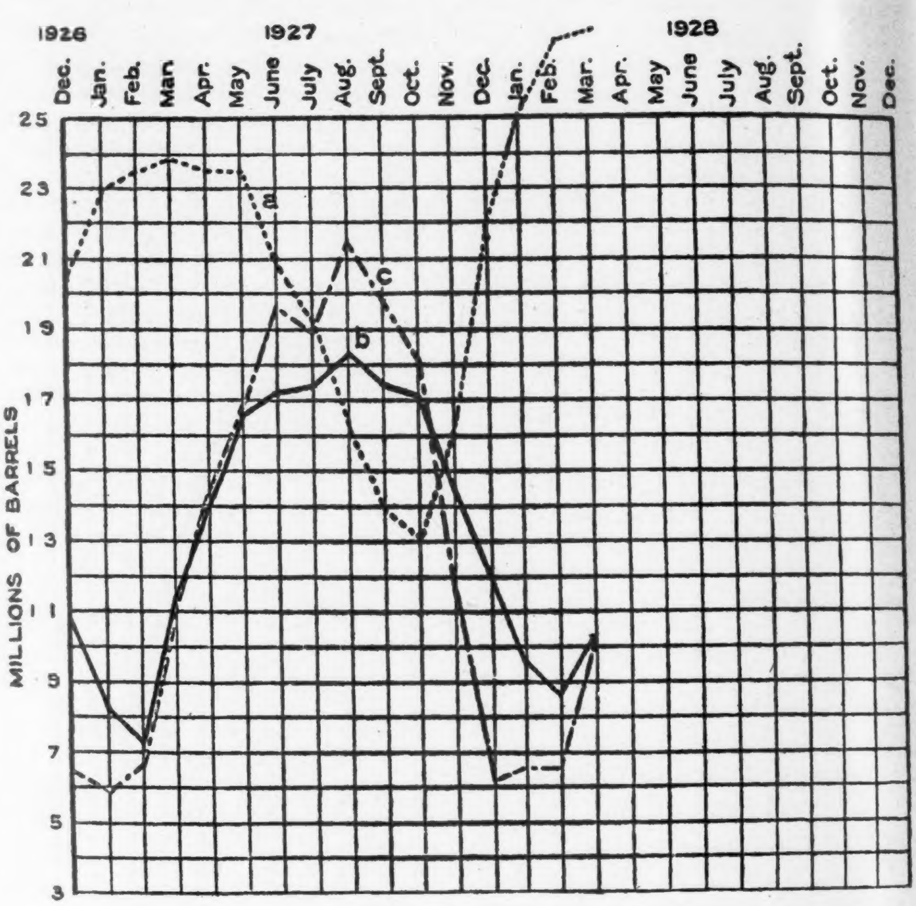
RELATION OF PRODUCTION TO CAPACITY

	Mar. 1928 Pct.	Mar. 1927 Pct.	Feb. 1928 Pct.	Jan. 1928 Pct.	Dec. 1927 Pct.
Month	51.7	61.9	47.5	49.4	60.7
12 mo. ended—	74.6	76.0	75.1	74.5	76.2

Stocks of clinker or unground cement at the mills at the end of March amounted to about 14,467,661 bbl.

Distribution of Cement

The accompanying table shows shipments from portland cement mills distributed among the states to which cement was shipped during January and February, 1927 and 1928.



(a) Stocks of finished portland cement at factories; (b) Production of finished portland cement; (c) Shipments of finished portland cement from factories

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN MARCH, 1927 AND 1928, AND STOCKS IN FEBRUARY, 1928, IN BARRELS

District	Production 1927—March	Production —1928	Shipments 1927—March	Shipments —1928	Stocks at end of March 1927	Stocks at end of March 1928	Stocks at end of Feb. 1928*
Eastern Penn., N. J. and Md.	2,997,000	2,512,000	3,081,000	2,396,000	5,677,000	6,682,000	6,566,000
New York	597,000	587,000	481,000	499,000	1,568,000	1,865,000	1,778,000
Ohio, West'n Penn. & W. Va.	1,262,000	851,000	932,000	833,000	3,272,000	3,411,000	3,393,000
Michigan	551,000	560,000	596,000	505,000	1,975,000	2,260,000	2,205,000
Wis., Ill., Ind. and Ky.	1,308,000	933,000	1,198,000	1,004,000	3,348,000	3,661,000	3,732,000
Va., Tenn., Ala., Ga., Fla. and La.	1,201,000	1,268,000	1,220,000	1,298,000	1,178,000	1,935,000	1,966,000
East'n Mo., Ia., Minn., S.Dak.	714,000	687,000	729,000	730,000	3,226,000	3,912,000	3,955,000
Wes'n Mo., Neb., Kan., Okla.	753,000	645,000	725,000	829,000	1,584,000	1,463,000	1,647,000
Texas	465,000	552,000	492,000	563,000	448,000	449,000	460,000
Colo., Mont. and Utah	118,000	160,000	138,000	174,000	470,000	482,000	496,000
California	1,179,000	1,171,000	1,195,000	1,082,000	692,000	853,000	764,000
Oregon and Washington	305,000	297,000	313,000	222,000	484,000	463,000	387,000
	11,450,000	10,223,000	11,100,000	10,135,000	23,922,000	27,436,000	27,349,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1927 AND 1928, IN BARRELS

Month	Production 1927	Production 1928	Shipments 1927	Shipments 1928	Stocks at end of month 1927	Stocks at end of month 1928
January	8,258,000	*9,771,000	5,968,000	*6,546,000	22,914,000	*25,116,000
February	7,377,000	*8,797,000	6,731,000	*6,563,000	23,563,000	*27,349,000
March	11,450,000	10,223,000	11,100,000	10,135,000	23,922,000	27,436,000
April	14,048,000	....	14,350,000	....	23,654,000	....
May	16,701,000	....	16,865,000	....	23,503,000	....
June	17,224,000	....	19,761,000	....	20,972,000	....
July	17,408,000	....	18,984,000	....	19,397,000	....
August	18,315,000	....	21,411,000	....	16,292,000	....
September	17,505,000	....	19,828,000	....	13,996,000	....
October	17,174,000	....	18,105,000	....	13,141,000	....
November	14,449,000	....	11,619,000	....	16,022,000	....
December	11,999,000	....	6,200,000	....	*21,950,000	....
	171,908,000	....	170,922,000	....	....	....

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN FEBRUARY, 1928

Exported to—	Barrels	Value
Canada	913	$ 6,094
Central America	23,082	70,565
Cuba	5,172	14,832
Other West Indies	2,581	6,861
Mexico	4,899	15,874
South America	22,319	84,149
Other countries	3,862	23,245
	62,828	$221,620

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN FEBRUARY, 1928

Imported from	District into which imported	Barrels	Value
Belgium	Florida	19,206	$23,854
	Galveston	6,000	7,948
	Los Angeles	5,000	6,005
	Massachusetts	24,107	41,008
	Oregon	4,120	5,163
	San Antonio	9,000	11,578
	South Carolina	27,905	34,334
	Washington	3,000	4,011
	Total	98,338	$133,901
Canada	Vermont	465	$685
Denmark	Porto Rico	48,722	$59,767
France	New York	2,216	$6,673
Germany	Philadelphia	6	$39
Poland and Danzig	Maryland	4,166	$3,555
United K'd'm	New York	10,495	$12,905
	Grand total	164,408	$217,525

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN JANUARY AND FEBRUARY, 1927 AND 1928, IN BARRELS*

Shipped to—	1927—January	—1928	1927—February	—1928
Alabama	132,569	235,233	127,020	254,968
Alaska	0	396	132	928
Arizona	54,088	82,184	41,677	72,365
Arkansas	46,014	62,143	59,309	76,288
California	998,230	1,030,965	649,302	909,617
Colorado	28,050	32,389	45,006	33,593
Connecticut	34,587	74,600	58,534	52,401
Delaware	11,170	13,077	13,885	11,304
District of Columbia	50,552	30,341	59,964	55,069
Florida	283,031	108,750	285,604	105,590
Georgia	119,770	113,857	134,787	97,616
Hawaii	22,491	20,290	31,022	26,923
Idaho	15,085	6,408	27,495	11,020
Illinois	301,829	354,763	417,054	401,092
Indiana	74,589	88,411	143,650	102,747
Iowa	38,157	30,488	55,837	41,520
Kansas	68,122	78,460	107,823	107,291
Kentucky	42,851	54,991	78,183	52,748
Louisiana	116,633	94,929	122,629	97,484
Maine	6,295	12,487	5,422	10,738
Maryland	135,015	87,650	123,421	66,413
Massachusetts	70,354	104,382	81,457	100,548
Michigan	258,848	267,206	301,666	287,114
Minnesota	41,396	50,480	61,047	49,334
Mississippi	51,325	57,528	62,783	50,677
Missouri	113,581	146,411	173,365	170,275
Montana	7,261	8,289	9,845	10,578
Nebraska	22,675	26,815	39,594	33,967
Nevada	2,724	3,293	3,649	4,524
New Hampshire	16,172	17,647	9,599	18,066
New Jersey	227,489	318,204	279,739	296,641
New Mexico	12,503	12,861	20,957	21,302
New York	700,414	800,428	855,484	768,681
North Carolina	141,582	135,292	168,720	100,830
North Dakota	3,575	2,102	3,081	2,641
Ohio	226,786	265,048	321,218	298,885
Oklahoma	164,266	201,422	191,130	203,245
Oregon	35,715	37,133	53,310	74,793
Pennsylvania	365,107	441,419	476,001	404,956
Porto Rico	2,550	0	1,275	0
Rhode Island	19,352	25,325	19,874	18,701
South Carolina	42,537	102,178	47,821	75,677
South Dakota	5,094	5,988	10,170	10,434
Tennessee	86,485	88,966	102,871	109,112
Texas	362,004	405,245	371,525	383,884
Utah	13,356	9,575	15,527	15,131
Vermont	5,606	11,363	4,472	15,902
Virginia	62,199	91,941	92,723	104,674
Washington	104,608	90,604	124,266	128,568
West Virginia	47,871	39,992	64,296	44,944
Wisconsin	76,148	74,881	100,245	91,829
Wyoming	5,972	5,262	7,754	8,427
Unspecified	19,886	†37,918	18,914	22,737
	5,894,569	†6,498,010	6,682,134	6,514,792
Foreign countries	73,431	47,990	48,866	48,208
Total shipped from cement plants	5,968,000	†6,546,000	6,731,000	†6,563,000

*Includes estimated distribution of shipments from three plants in January and February, 1927 and 1928.
†Revised.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1927 AND 1928, IN BARRELS

Month	Production 1927	Production 1928	Stock end of month 1927	Stock end of month 1928
January	10,410,000	11,858,000	9,989,000	*9,672,000
February	9,253,000	11,363,000	11,943,000	*12,237,000
March	12,397,000	12,501,000	12,997,000	14,467,000
April	14,246,000	....	13,335,000	....
May	15,677,000	....	12,514,000	....
June	15,437,000	....	10,926,000	....
July	15,697,000	....	9,609,000	....
August	16,396,000	....	7,887,000	....
September	15,931,000	....	6,490,000	....
October	16,469,000	....	5,960,000	....
November	14,698,000	....	6,374,000	....
December	13,177,000	....	*7,675,000	....

*Revised.

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN MARCH, 1927 AND 1928, IN BARRELS

District	1927—Production	—1928	Stocks at end of month 1927	1928
Eastern Penn., New Jersey and Maryland	3,394,000	2,939,000	2,129,000	1,948,000
New York	635,000	750,000	579,000	1,023,000
Ohio, Western Pennsylvania and West Virginia	1,194,000	1,123,000	1,608,000	1,890,000
Michigan	901,000	908,000	1,765,000	1,880,000
Wisconsin, Illinois, Indiana and Kentucky	1,448,000	1,662,000	1,781,000	2,457,000
Virginia, Tenn., Ala., Ga., Fla. and La.	1,211,000	1,226,000	816,000	995,000
Eastern Missouri, Iowa, Minnesota and S. Dak.	796,000	913,000	931,000	1,096,000
Western Missouri, Nebraska, Kansas, Oklahoma	704,000	667,000	676,000	559,000
Texas	451,000	544,000	125,000	149,000
Colorado, Montana and Utah	171,000	212,000	863,000	437,000
California	1,143,000	1,180,000	1,143,000	1,419,000
Oregon and Washington	349,000	377,000	581,000	614,000
	12,397,000	12,501,000	12,997,000	14,467,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1927 AND 1928

Month	1927—Exports Barrels	Value	—1928 Barrels	Value	1927—Imports Barrels	Value	—1928 Barrels	Value
January	75,346	$254,072	56,400	$204,875	193,175	$269,661	234,753	$342,797
February	71,404	233,985	62,828	221,620	130,421	200,680	164,408	217,525
March	67,956	240,165	....	....	181,145	261,519	....	....
April	72,383	243,832	....	....	191,868	313,262	....	....
May	59,332	205,574	....	....	178,929	263,618	....	....
June	69,205	237,281	....	....	129,111	201,682	....	....
July	72,337	229,737	....	....	175,035	249,665	....	....
August	61,371	209,198	....	....	117,605	170,167	....	....
September	57,888	207,817	....	....	233,066	297,716	....	....
October	67,639	230,668	....	....	221,274	321,777	....	....
November	79,869	257,476	....	....	141,485	190,419	....	....
December	62,099	226,960	....	....	156,609	209,205	....	....
	816,829	$2,776,765	....	....	2,049,723	$2,949,371	....	....

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN FEBRUARY, 1928

	Barrels	Value
Alaska	1,789	$ 5,395
Hawaii	20,375	48,342
Porto Rico	2,886	7,359
	25,050	$61,096

Rains Damage Quarry

THE Lively Lime Products Co., Gold Hill, Ore., was damaged recently when heavy rains sent thousands of tons of earth and debris down the mountainside, which, according to report, partially buried the quarry. The slide occurred at night, and as no night shift was at work, no one was injured.

Charles Warner Co. Acquires Merion Lime and Stone Co.

THE Charles Warner Co. of Wilmington, Del., announces that it has assumed control of the Merion Lime and Stone Co. of Norristown, Penn. This will add about 25,000 tons per year to the Warner company's production.

The Merion company has been taken over under a lease with an option to purchase. The personnel of the company is to remain unchanged so far as the operating staff is concerned. A dolomitic lime is produced and the plant contains seven kilns.

The Charles Warner Co. has a lime plant at Cedar Hollow, Penn., and gravel plants at Tullytown, Penn. The company is affiliated with the American Lime and Stone Co., which has several plants at Bellefonte and nearby towns. Charles Warner is president of both companies.

Single Blast Furnishes Rock for Year's Operation

NEARLY 250,000 tons of rock were displaced in a large blast at the Clingan plant of the John T. Dyer Quarry Co., Reading, Penn., recently. It is estimated that sufficient material was dislodged to supply the crushers for a year. Du Pont company explosives engineers co-operated with the quarry superintendent in supervising the blast, which required approximately 22 tons of dynamite.—*Reading* (Penn.) *Eagle.*

Gravel Company for Oil City, Pennsylvania

THE reorganized management of the former Allegheny River Sand and Gravel Co., West Hickory, Penn., plan to move their plant to the vicinity of the large sandbars at Alcorn Island, north of Oil City. It is proposed to move the equipment from West Hickory as soon as the stage of water in the river will permit. Operations will be started first with one river dredge, one land derrick, four barges and a gasoline launch. From ten to a dozen men will be employed at the outset and the initial plant will be capable of dredging and washing 2000 tons of sand for the market daily. The new firm is the Oil City Sand and Gravel Co., under the management of Capt. Charles A. Smith of Blawnox, Penn.—*Warren* (Penn.) *Times.*

Cement Safety Meeting at Lansing Another Success

THE regional safety meeting conducted by the Portland Cement Association at the Olds hotel, Lansing, Mich., on April 12, in co-operation with the Michigan Safety Conference, added another successful meeting to the growing list held for the cement mill operating departments in various parts of the country.

G. A. Lawniczak

The high point in the day's program was reached when Commissioner Eugene J. Brock, head of the state department of Industry and Labor, addressed the assembled group of executives, superintendents and foremen in an earnest appeal for more progress in accident prevention work. It was at Mr. Brock's warm invitation that the regional meeting was held in Lansing and he readily consented to address the gathering. G. A. Lawniczak, superintendent of the Alpha Portland Cement Co.'s mill at Bellevue, Mich., acted as general chairman and J. H. Barbazette, manager of operations of the Alpha company, presided at the afternoon session. Among the executives present was Homer E. Sly, vice-president of the Petoskey Portland Cement Co., who told in an impressive way of the uphill battle at the Petoskey mill and the present encouraging outlook. Mr. Sly mentioned, especially, the great value of cleanness around cement mills in preventing accidents and stimulating the interest of the workmen.

Commissioner Brock, in referring to Michigan industrial accidents in general, pointed out that there had been a reduction of 12½% during the past year, a remarkable record in view of the conditions faced. Mr. Brock stated the compensation paid injured workmen in the state last year cost Michigan industries $10,000,000 and that compensible accidents actually cost $4.25 for every dollar paid in compensation, bringing the total cost of accidents of the class to $42,500,000. His figures covering non-compensible accidents showed that the total cost of industrial mishaps of all kinds to the Michigan manufacturers was about $70,000,000 last year. Mr. Brook stated that where accidents were being reduced, production almost automatically increased in proportion.

Accident figures for the Michigan cement mills analyzed at the meeting showed much progress, but an average not as good as that for the entire country. Two Michigan plants, those of the Alpha Portland Cement Co. at Bellevue and the Consolidated Cement Corp. at Cement City, Mich., completed 1927 with only one accident each. Both were accorded ovations as promising "runners up" in the Portland Cement Association trophy contest. The program numbers were as follows:

Morning Session—10:30 A. M.

10:15 A. M. Meeting called to order by G. A. Lawniczak, superintendent, Alpha Portland Cement Co., chairman of the local committee.

Report on Safety Work in the Cement Industry in 1927. A. J. R. Curtis, secretary, Committee on Accident Prevention, Portland Cement Association.

Good Lighting as a Factor in Safe Operation. W. J. Carvey, illuminating engineer, General Electric Co.

Afternoon Session—2 P. M.

J. H. Barbazette, manager of operations, Alpha Portland Cement Co., chairman.

Address, Eugene J. Brock, chairman, Department of Labor and Industry, Lansing.

Address, Homer Sly, vice-president, Petoskey Portland Cement Co.

George M. Chute, engineering department, General Electric Co., "Some Ways to Eliminate Electrical Hazards."

W. L. White, engineer, E. I. du Pont de Nemours and Co., "Use and Handling of Explosives."

G. W. John, assistant superintendent, Petoskey Portland Cement Co., "How to Hold Effective Safety Committee Meetings."

Round Table Discussion of Currenty Safety Problems led by: F. E. Town (Manitowoc), G. A. Lawniczak (Alpha), F. E. Selfe, Chief Engineer (Consolidated), H. A. Browne (Huron), A. G. Texler (Newaygo), W. L. Kaiser (Peerless-Egypt, Detroit), L. E. Nodell, Assistant Superintendent (Wolverine-Coldwater), John Dieterman (Wolverine-Quincy), A. A. Oesterle (Peerless-Egyptian, Port Huron).

At the close of the program all mill delegates present pledged the full support of their organizations in carrying out the June No-Accident Campaign in the hopes that Michigan may be able to "go over the top" during the annual no-accident drive during the coming June. The registration was as follows:

J. H. Barbazette

Registration

Alpha Portland Cement Co., Bellvue, Mich.
J. H. Barbazette, manager of operations (Chicago)
G. A. Lawniczak, superintendent
C. H. Denman, chemist
Edward Simcox, packing house foreman

Consolidated Cement Corp., Cement City, Mich.
F. E. Selfe, chief engineer
Henry Douglas, operating foreman
Vern R. Harris, rotary foreman
D. G. Guitner, packing foreman
J. W. Blakely, stock clerk

Manitowoc Portland Cement Co., Manitowoc, Wis.
F. E. Town, superintendent

Newaygo Portland Cement Co., Newaygo, Mich.
L. E. Smith, superintendent
Arthur G. Trexler, master mechanic.
F. O. Race, chief electrician
Harley E. Roebuck

Peerless-Egyptian Cement Co., Detroit, Mich.
W. L. Kaiser, superintendent
L. L. Simmons, chemist

W. E. Pitman, repairman
P. L. Polk, mill foreman

Peerless-Egyptian Cement Co., Port Huron, Mich.
A. A. Oesterle, superintendent
J. L. Bateman, chief chemist
C. MacDermott, mill clerk

Huron Portland Cement Co., Alpena, Mich.
H. C. Schemm, assistant superintendent of plants (Detroit)
W. M. Smith, chief chemist
H. A. Browne, efficiency engineer
A. L. Whidan, packing house foreman
G. J. Van Dusen, accountant
W. G. MacDonald, chief electrician

Petoskey Portland Cement Co., Petoskey, Mich.
Homer Sly, vice-president
George W. John, assistant superintendent
C. P. Phillips, chief chemist
Lyle E. Ernst, plant office manager

Sandusky Cement Co., Bay Bridge, Ohio
A. J. Little, superintendent

Sandusky Cement Co., Toledo, Ohio
W. J. Worthy, superintendent
B. F. Hobbins, assistant superintendent

Wolverine Portland Cement Co., Coldwater, Mich.
L. C. Nodell, assistant superintendent
J. J. Dalchaw, mill foreman

Wolverine Portland Cement Co., Quincy, Mich.
J. Dieterman, assistant superintendent
C. F. Globensky, packing house foreman

Portland Cement Association, Chicago, Ill.
A. J. R. Curtis, assistant to general manager
H. O. Stone, Michigan manager

Others
Eugene J. Brock, commissioner of industry and labor, Lansing
W. J. Garvey, General Electric Co., Detroit
John B. Dakin, Olds Motor Works, Lansing.
H. J. Duosha, E. I. Du Pont de Nemours & Co., Flint, Mich.
R. W. Hale, safety engineer, Michigan Mutual Liability Co., Detroit.
H. G. Jacobson, Bates Valve Bag Corp., Chicago
G. E. McKennon, E. I. Du Pont de Nemours & Co., Flint, Mich.
W. T. White, E. I. Du Pont de Nemours & Co., Flint, Mich.

A German Engineer Criticizes Suggestions of H. H. Blaise

SIR—Will you kindly permit me to say something regarding the article of H. H. Blaise, "Practice vs. Possibility in the Cement Manufacturing Industries," in the edition of your very interesting journal of February 18, 1928?

Re: "Possible Economies in Raw Grinding." It is practically impossible to drive out the carbonic acid of limestone with stack gases of from 400 to 1200 deg. F. With the normal air-pressure (14.698 lb./sq. in.) the evaporation of the CO_2 commences, according to Le Chatelier, at 812 deg. C. = 1494 deg. F., according to Block at 856 deg. C. = 1573 deg. F. In order to drive out the CO_2 with 1200 deg. F. gases, the air-pressure would have to be either reduced to about 2.7 lb./sq. in. or the time of burning so considerably extended that it could not be brought into accord with the burning time of the clinker. Either is, even with 1200 deg. F., practically impossible to carry through, much less at 400 deg. F.

On the other hand, Mr. Blaise's proposition to burn the limestone before the grinding and to change the burnt lime by hydration to a lime powder, in order to (1) save the grinding, (2) increase the output of the kiln, is already quite old, for this was already done about 35 years ago by the Asano Cement Works (Japan). The complications, however, by burning the limestone in a separate kiln, by the manipulation of the hydration of the burnt lime, and by the mixing with clay (which had to be separately ground or fined on the wet process) made this process still more expensive than the usual manner of manufacture.

Re: "Kiln Control." Mr. Blaise asks that the fuel should not be introduced as at present with only 35% but with 100% of the necessary air of combustion. That is, of course, only possible if no secondary air can enter the kiln, either through the kiln hood or through the clinker cooler. In other words, the clinker must be discharged through an air lock and the rotating cylinder must be closed air-tight against the kilnhead.

So far it is not known that rotary kilns exist which correspond to these requirements.

The following, however, should be also noted:

The larger the proportion of air (which is, of course, a bad heat conductor) is in the mixture of fuel and air, the slower will be the ignition and the further the burning zone moves into the kiln. With a three times larger quantity of air, as proposed by Mr. Blaise, the burning zone would be shifted, according to my estimate, about 30 ft. towards the stack. The consequence would be that the stack gases would leave the kiln at a much higher temperature, causing greater loss of heat than in the usual operation.

CARL NASKE,
Civil Engineer.

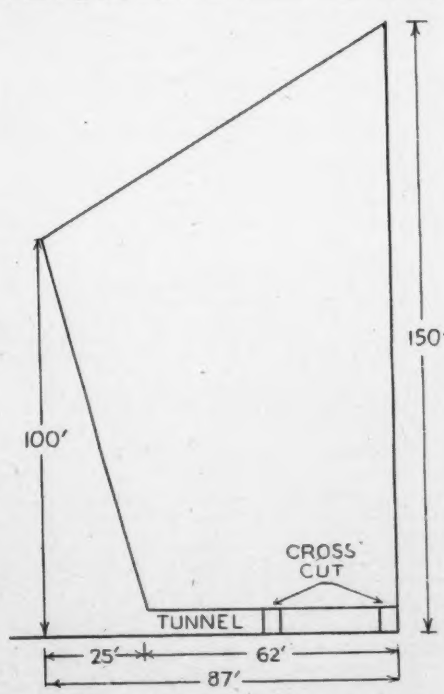
Charlottenburg 2, Germany, April 4, 1928.

An Unusual Blasting Problem

A HIGH-GRADE deposit of limestone near Le Grande, Utah, presented a difficult situation for its removal. The deposit, owned by the Portland Cement Co. of Utah, stood upright between two walls of siliceous rock. The top of the deposit offered no opportunity for churn drilling and an added hindrance was the face which hung 25 ft. over the base of the deposit.

The problem was to blast out the limestone from between the walls and throw it down where steam shovels could load the shattered material for transportation to the cement plant. The deposit measured 75 ft. wide and 150 feet high. The hanging foot walls, between which lay the limestone, dipped approximately at an angle of 75 degrees.

The plan followed was to drive a coyote tunnel with two cross-cuts into the deposit at its base as indicated in the diagram. The operation proved successful and very little secondary blasting was necessary.—*Explosives Engineer.*



Profile of projecting face showing method of tunneling

Profitless Prosperity

PROFITLESS PROSPERITY is a pamphlet being widely circulated at present, a reprint of an article by C. H. Boynton, published in the *Tariff Review* for March. The author is assistant to the president of the Atlas Portland Cement Co. It is largely devoted to the effect of importations of foreign cement on labor.

It is stated that American labor has already lost 8,953,613 working hours since 1921 through cement importations and that most of this loss has gone to Belgium, where labor is paid 10% less than in 1913, while American labor is paid 130% more than in 1913. Belgian cement workers' wages are stated to average 12½ c. per hr. with hours restricted by law to eight. Standards of living are said to be unbelievably low from an American viewpoint. This condition, it is asserted, is being kept up by laws that depress living costs and regulate wage scales.

One interesting fact brought out is that the water rate from Antwerp to Philadelphia, 38 c. per bbl., is less than the rail freight rate from the nearest mill in the Lehigh Valley, only 71 miles distant, which is 46 c. per bbl.

Move Against Sub-Standard Materials

THE building and construction interests of Northern New Jersey and New York City are taking steps to rid the market of sub-standard building materials, according to Allan E. Beals of the *Dow Service Daily Building Reports.* He goes on to say that since credit has been refused to speculative builders in New York City who use sub-standard materials many of them have begun operating in New Jersey.

Meetings were called in both New York and Newark to consider the situation, and they were well attended by architects, engineers, building inspectors and representatives of those who finance new construction.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Mar. 24	Mar. 31	Mar. 24	Mar. 31
Eastern	2,275	2,216	3,660	3,934
Allegheny	2,963	3,171	3,920	4.430
Pocahontas	327	308	782	819
Southern	587	623	9,203	1,066
Northwestern	1,062	832	3,795	3,109
Central Western	418	407	6,982	7,148
Southwestern	304	352	5,522	5,801
Total	7,936	7,909	33,864	35,907

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

	Limestone Flux		Sand Gravel and Stone	
	1927	1928	1927	1928
	Period to Date		Period to Date	
District	Apr. 2	Mar. 31	Apr. 2	Mar. 31
Eastern	29,932	24,566	29,004	28,186
Allegeny	41,332	36,303	41,288	33,042
Pocahontas	2,656	2,985	5,134	6,840
Southern	6,326	6,744	127,610	112,678
Northwestern	12,365	8,776	34,714	24,762
Central Western	5,265	5,188	72,000	72,715
Southwestern	3,661	5,102	53,491	57,294
Total	101,428	89,664	363,241	335,517

COMPARATIVE TOTAL LOADINGS, 1927 AND 1928

	1927	1928
Limestone flux	*101,428*	*89,664*
Sand, stone, gravel	*363,241*	*335,517*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning April 21:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

14316. **Bird gravel or sand**, carload, minimum weight 60,000 lb., from Keene, N. H., to Boston and Springfield, Mass., 14c; to Portland, Me., 18c. Reason—To establish rates comparable with rates now published on traffic of similar nature.

14354. **Broken, ground or unburnt limestone**, carloads, minimum weight 50,000 lb., from North Pownal, Vt., to various stations on the Rutland R. R., routing via White Creek, N. Y., viz.: Chateaugay, Cherubusco, Clinton Mills, Ellenburgh, Forest, Irona, Altona, Woods Falls, Mooers Forks, Mooers Junction, Champlain, Rouses Point, N. Y., Alburgh, Isla La Motte, North Hero, Grand Isle, South Hero, Burlington, Shelburne, Charlotte, No. Ferrisburg, Ferrisburg, Vergennes, New Haven Jct. and Beldens, Vt., 12½c; to Lisbon, Madrid, Norwood, Knapps, Winthrop & Brasher, North Lawrence, Moira, Brushton, Bangor, Malone and Burke, N. Y., 13c. Reason—To place shippers located at North Pownal, Vt., on a comparable basis with those located in Trunk Line territory.

14380. **Ground limestone and agricultural lime**, carloads, minimum weight 40,000 lb., from Winooski, Fonda Junction, Highgate Springs and Swanton, Vt., to Williamsville and Newfane, Vt., ground limestone, 12c; agricultural lime, 13½c, via C. V. Ry. Reason—To establish commodity rates on a comparable basis with rates to stations in the same vicinity.

14381. **Sand and gravel**, carloads (See Note 3), from Leeds Jct. (Libby's Pit), Me., to Pine Point, Scarboro, West Scarboro, Oak Hill, Gorham, Me., $1.25; Kennebunk, Biddeford, Saco, Old Orchard, West Kennebunk, Wescott, Bradbury, Bar Mills, Buxton, Me., $1.30; Wells Beach, Highpine, Alfred, Waterboro, Me., $1.35; Cummings, North Berwick, Agamenticus, Eastwood, Springvale, $1.40; Eliot, Jewett, South Berwick, Me., $1.45 per net ton. Reason—To establish rates comparable with those currently effective in other New England territory.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

TRUNK LINE ASSOCIATION DOCKET

18378. **Sand** (other than blast, engine, fire, foundry, glass, molding, quartz, silex, silica and filter, carloads (See Note 2), from Mt. Holly Springs, Penn., to Carlisle, Penn., 60c per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

18398. **Sand** (other than molding, foundry, engine, etc.) **and gravel**, carloads (See Note 2), from Wadsworth and Maxwells, N. Y., to North LeRoy, Holmes, Stafford and Batavia, N. Y., 75c per 2000 lb. Reason—Proposed rates are comparable with rates from Maxwells to Manchester and Victor, N. Y.

18402. **Stone, natural** (other than bituminous asphalt rock), **crushed**, N. O. I. B. N., carloads (See Note 2), from New Hamburg, N. Y., to stations on the Harlem & Putnam divisions of the N. Y. C. R. R., rates ranging from $1.05 to $1.35 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in effect from South Norwalk, Wallingford and Rocky Hill, Conn., to destination points in the same general territory.

18407. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), to Bordentown, N. J., from Morrisville, Penn., 65c, and from Tullytown, Penn., 70c per 2000 lb. Reason—Proposed rates are comparable with rates from Morrisville and Tullytown, Penn., to Wilburtha and Washington Crossing, N. J.

SOUTHERN FREIGHT ASSOCIATION DOCKET

39323. **Limestone, marble or marl, ground or pulverized**, from Boyd, Tenn., to Southeastern and Carolina points. It is proposed to add Boyd, Tenn., as a point of origin in Southern Railway I. C. C. A10166, and apply the mileage scale of rates on limestone, marble or marl, ground or pulverized, to the same destinations that rates are now published in this tariff from Knoxville, Harriman and other points in East Tennessee.

39327. **Limestone, broken, crushed or ground**, from Colrock and Margerum, Ala., to Eastern cities. It is proposed to establish the following reduced all-rail rates on **limestone, broken, crushed or ground**, containing 2.5% or more of asphalt, carloads (See Note 3), from the origins mentioned (in cents per net ton):

Baltimore, Md.	413
Philadelphia, Penn.	473
Jersey City, N. J.	*543

*When via B. & O., rate, 613c.

39393. **Limestone, ground or pulverized**, from Ocala, Fla., to Greensboro, N. C. Combination basis now applies. Proposed rate on ground or pulverized limestone, carloads, minimum weight 60,000 lb., from Ocala, Fla., to Greensboro, N. C., 340c per net ton.

39416. **Fluxing stone**, from Lyle, Tenn., to Rockdale, Tenn. It is proposed to establish rate of 110c per net ton on fluxing stone, carloads, from Lyle to Rockdale, Tenn. Present rate, 125c per net ton.

39436. **Agricultural stone** from Yellow Rock, Ky., to L. & N. R. R., Eastern Kentucky Division stations. Class "N" rates now apply and it is proposed to establish rates on **stone, agricultural (ground limestone)**, carloads, minimum weight 60,000 lb. Note—When loaded in box cars, same to be lined with strong paper to prevent loss. From Yellow Rock, Ky., to the above mentioned destinations made on the same basis as observed in the recent past in establishing rates on this commodity between points in southern territory. Statement of present and proposed rates will be furnished upon request.

39462. **Crushed stone**, etc., from Cerulean and Cedar Bluff, Ky., to Southern Ry. stations between Boonville and Huntingburg, Ind. No through rates in effect. Proposed rate on **crushed stone, stone screens or stone refuse** (not ground or pulverized stone), carloads (See Note 3), from Cerulean and Cedar Bluff, Ky., to De Gonia, Tennyson, Pigeon, Gentryville, Lincoln City, Dale, Johnsburg and Huntingburg, Ind., 126c per net ton, made on the same basis as Greencastle, Ind.

39466. **Stone, marble or slate, broken or crushed**, from Boyd, Tenn., to Ohio and Mississippi River crossings and points in C. F. A. territory. It is proposed to establish through commodity rates on stone, marble or slate, broken or crushed, carloads (See Note 1), from Boyd, Tenn., to Ohio and Mississippi River crossings and C. F. A. points to which rates are published in Agent Glenn's Northbound Commodity Tariff I. C. C. A554, from Knoxville and Concord, Tenn., same as rates currently in effect from Knoxville and Concord, Tenn.

39482. **Crushed marble**, from Boyd, Tenn., to eastern destinations. No through rates in effect, and it is proposed to establish rates on marble (crushed), carloads (See Note 3), from Boyd, Tenn., to eastern and Virginia cities and interior eastern points to which rates are published in Agent Speiden's I. C. C. 1058 from Knoxville, Tenn., 1c per 100 lb. higher than rates currently in effect from Knoxville, Tenn.

37891. (Originally docketed for January 23, 1928, hearing—Docket No. 401.)—**Limestone, ground or pulverized**, from Calera, Ala., to southern points. No through rates now in effect, and it is proposed to establish commodity rates on limestone, ground or pulverized, carloads (See Note 3), from Calera, Ala., to stations on the following lines (except points in Florida south of the S. A. L. Ry., Jacksonville-River Junction line): Alabama Great Southern R. R.; Atlanta & West Point R. R.; Atlanta, Birmingham & Coast R. R.; Atlantic Coast Line R. R.; Central of Georgia Ry.; Georgia R. R.; Georgia Southern & Florida Ry.; Gulf & Ship Island R. R.; Gulf, Mobile & Northern R. R.; Illinois Central R. R.; Mobile & Ohio R. R.; Muscle Shoals, Birmingham & Pensacola R. R.; New Orleans & Northeastern R. R.; St. Louis-San Francisco R. R.; Seaboard Air Line Ry.; Southern Ry.; Western Ry. of Alabama; Yazoo & Mississippi Valley R. R. The proposed rates to be made on basis of the same scale as applicable from southern producing points to stations on the above named lines for corresponding distances, except the current Dolcito, Ala., rates are to apply, generally speaking, from Calera, Ala., to A. C. L. R. R. stations.

18421. (B) **Agricultural and land lime**, carloads, minimum weight 30,000 lb. (C) **Ground limestone**, carloads, minimum weight 50,000 lb. Rates in cents per 100 lb.:

From Ashcom, Penn., to:	(B)	(C)
So. Brownsville to E. Millsboro, Penn.	11	10
E. Rices Landing to Cassville, W. Va.	11	10
Lemley to Brave, Penn.	14	13
Granville to Jct. Browns Run Br., Penn.	11	10

Reason—To establish same rates as are now in force from Bellefonte and Pleasant Gap, Penn.

18422. **Agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb., also **ground limestone**, carloads, minimum weight 50,000 lb. Rates in cents per 100 lb.:

From York, Penn., to following N.Y. points:

To	Rate	To	Rate
Johnstown	22	Mayfield	23
Gloversville	22½	Cranberry Creek	23½
Broadalbin	23	Northville	24

Reason—The proposed rates are comparable with rates on like commodities from Bellefonte and Pleasant Gap, Penn.

18427. **Agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb., also **ground limestone**, carloads, minimum weight 50,000 lb., from Falling Waters, Berkeley, Martinsburg and Bunker Hill, W. Va., to E. & N. Junction, Penn. (Thirteenth St. Junction), Penn., Easton (Bushkill Station), Penn., and Easton (Thirteenth St.), Penn., 16c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Bellefonte and York, Penn., to Easton, Penn.

18436. **Molding sand, carloads** (See Note 2), from Hutchins, Penn., and Freeman, Penn., to Killbuck, N. Y., inclusive, to Erie points, Redhouse, Jamestown, Lakewood, N. Y., Columbus, Corry, Geneva, Transfer, Sharpsville, Sharon, Penn., Orangeville, Hubbard, Youngstown, Girard, Niles, Phalanx, Corlett, Cleveland, Ohio, and various, rates ranging from $1.35 to $2.25 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from and to points in the same general territory, also proposal will have the effect of eliminating all fourth section departures.

18438. **Gravel and sand**, other than blast, engine, foundry, glass, molding, silex or silica, carloads (See Note 2), from Cairnbrook, Penn. Rates in cents per 2000 lb.:

To	Rate
South Fork, Penn., to Lovett, Penn., incl.	70
Salix, Penn.	70
Elton, Penn.	60
Eureka Colliery No. 40 to Eureka No. 36, incl.	60
Eureka No. 41 to Duncan Sdg., Penn., incl.	70
Hagevo Colliery, Penn., to Ashtola, Penn., incl.	70

Reason—The proposed rates are comparable with rates now in force from Kiskiminetas Jct., Penn., and Strangford, Penn., to Verona, Tunnelton, Youngwood, Scottglen, Penn., and various.

CENTRAL FREIGHT ASSOCIATION DOCKET

18155. To establish a rate of $4.00 per net ton on **sand**, carloads, Rockport, Ind., and other points on the Southern Ry. in southern Indiana, to Pittsburgh, Penn. Present rate, $4.66 per net ton.

18157. To establish on **crushed stone**, carloads, Delphos, Ohio, to points in Indiana, following rates per net ton (from Delphos, Ohio):

To	Prop.	Pres.*	To	Prop.	Pres.*
Columbia City	.90	$0.92	Hoagland	.90	$2.40
Collins	.95	2.70	Huntertown	.90	2.70
Churubusco	.85	2.70	Wallen	.85	2.70
Air	.90	2.70	La Otto	.90	2.70
Cedar	.90	2.70	Kendallville	.95	2.80
Auburn	.95	2.70			

*Sixth class.

18159. To establish on **crushed stone**, carloads, East Liberty to Harrison, Ohio, rate of 135c per net ton. Route via N. Y. C. R. R., Marysville or Bellefontaine, Ohio, and C. C. C. & St. L. Ry. Oxford, Ohio, rate of 125c per net ton. Route via N. Y. C. R. R., Wapakoneta, Ohio, and B. & O. R. R. Present rates, on classification basis.

18167. To establish on **sand, viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica**, carloads, James Siding (Belmar) and Van, Penn., to Bolivar, Penn., rate of 227c per net ton. Present rate, sixth class.

18168. To establish on **crushed stone**, carloads, Kokomo, Ind., to Hagerstown and New Castle, Ind., rate of 85c and 80c per net ton respectively. Present rates, $1.15 and $1.04 per net ton, respectively, per Penn. R. R. Tariff 124A, I. C. C. F1858.

18169. To establish on **crushed stone**, carloads, Kenneth, Ind., to points in Michigan, rates (in cents per net ton) as shown below:

To	Prop.	Pres.	To	Prop.	Pres.
Niles	110	151	Kalamazoo	122	340
Cassopolis	120	151	Three Rivers	120	340
Hartford	138	207	Schoolcraft	120	340
Lawton	120	340	Grand Jct.	138	207
South Haven	138	380			

18170. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, Vincennes, Ind., to points in Indiana, rates (in cents per net ton) as shown below:

To	Prop.	Pres.	To	Prop.	Pres.
Bruceville	60	69	Westphalia	69	76
Bicknell	60	69	Sanborn	69	76
Edwardsport	60	76	Marco	69	76

18176. To establish on **sand and gravel**, carloads, from Palestine, Ill., Riverton, Merom and Indianapolis, Ind., to Dodgson and Victor, Ind., rate of 90c per net ton. Present rates, combination rates.

18181. To establish on **gravel**, carloads, from St. Louis, Mo., and East St. Louis, Ill., to St. John, New Brunswick, rate of $8 per net ton. Present rate, sixth class basis.

18182. To establish on **crushed stone**, carloads, from Limestone, Ohio, to Detroit, Mich., via W. & L. E. Ry., Toledo, Ohio, and Pere Marquette Ry., rate of 95c per net ton. Present rate, 120c.

18213. To establish on **sand and gravel**, carloads, North Judson and Kewanna, Ind., to Ohio and Indiana, rates as shown below:

From	To	Prop.	Pres.
	Cheviot, Ohio	¶20½	*218
	La Crosse, Ind.	§ 8½	* 73
No. Judson, Ind.	Marion, Ind.	§14	*† 99
	Muncie, Ind.	§16	*†101
	Richmond, Ind.	§18	*†124
Kewanna, Ind. (Williams Sw. 1¼ miles east of Kewanna, Ind.)	Beardstown, Ind. (Gravel Switch four miles west of Beardstown, Ind.)	§ 9	‡ 63

*C. & O. Tariff 1241E, I. C. C. 10329 (Item 290). Rates in cents per ton of 2000 lb.

†Intrastate only.

‡C. & O. Tariff 1241E, I. C. C. 10329 (Item 300). Rates in cents per ton of 2000 lb.

¶C. & O. Tariff 1246B, I. C. C. 9417 (sixth class), in cents per 100 lb.

§B. T. Jones, Tariff 222, I. C. C. 937.

18214. To establish on **sand and gravel**, carloads, South Terre Haute, Fort Harrison and Averitt, Ind., to Oolitic, Ind., rate of 88c per net ton. Present rate, 101c except to Averitt, Ind., 92c per net ton.

18215. To establish on **crushed stone**, carloads, Woodville, Ohio, to Plymouth and Shelby, Ohio (B. & O. R. R. delivery), rate of 90c per net ton. Present rate, $1 per net ton.

18216. To establish on **crushed stone**, carloads, Greencastle, Ind., to Rosston, Ind., rate of 90c per net ton. Present rate, sixth class.

18219. To establish on **sand and gravel**, carloads, Columbus, Ohio, to Coolville, Ohio, rate of 115c per net ton. Route—Via N. Y. C. R. R., Grosvenor, Ohio, and B. & O. R. R. Present rate, sixth class.

18220. To establish on **crushed stone, carloads**, Milltown and Marengo, Ind., to stations on C. & E. I. Ry. in Indiana, viz.: Terre Haute, Pimento, Farmersburg, Shelburn, Sullivan, Paxton, Carlisle, Oaktown, Emison and Vincennes, rate of 105c per net ton. Present rate, 113c per net ton.

18221. To establish on **crushed stone**, in bulk only; **crushed stone screenings**, in bulk only, carloads; **limestone, agricultural** (not ground or pulverized), in bulk in open top cars only, carloads, and stone tailings, carloads, Narlo, Ohio, to stations in Ohio, rates as shown below. Present and proposed rates, per net ton:

To Erie stas.	Pres.	Prop.	To N. O. stas.	Pres.	Prop.
Spencerville	(*)	$1.00	Vaughnsville	(*)	.90
Elgin	(*)	1.05	Rimer	(*)	.90
Burghill	$1.50	1.25	N.Y.C. stas.		
Canfield	1.40	1.25	Jefferson	1.30	1.25
Lisbon	(*)	1.35	Wick	(*)	1.35
C. N. stas.			Kinsman	(*)	1.35
Paulding	1.00	.95	Moulton	(*)	1.25
Scott	1.10	.95	B.&O. stas.		
Van Wert	1.10	1.00	Wapakoneta	1.40	1.10
Rockford	1.10	1.05	Cambridge	1.50	1.45
W. Alexandria	(*)	1.35			
Big Four stas.					
Versailles	1.40	1.20			

(*)—Sixth class.

18223. To establish on **crushed stone**, carloads, (a) from Spore, Ohio, to Coolville, Ohio, rate of 135c per net ton, route via N. Y. C. R. R., Grosvenor, Ohio (rate per net ton), to Coolville, Ohio, 115c; Porterfield, Ohio, 115c; Belpre, Ohio, 125c. Route via N. Y. C. R. R., Grosvenor, Ohio, and B. & O. Present rate, classification basis.

18224. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, Jonesville, Mich., to Oak Harbor and Port Clinton, Ohio, rate of 115c per net ton. Present rates—to Oak Harbor, 127c per net ton, and to Port Clinton, 138c per net ton.

TRUNK LINE ASSOCIATION DOCKET

18446. **Broken stone**, carloads (see Note 2), from Avondale, Penn., to Philadelphia, Penn., $1.60 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Baltimore, Md., to Philadelphia and Chester, Penn., and from Wilmington, Del., to Washington, D. C.

14877. **Gravel and sand** (other than blast, engine, foundry, glass, molding or silica), carloads, (see Note 2) from Mt. Bethel, Portland and Stier, Penn., to Stroudsburg, Penn., 85c per ton of 2000 lb. Reason—The proposed rates are comparable with rates published by the D. L. & W. R. R. from Portland district to Stroudsburg, Penn.

18480. **Crushed stone**, N. O. I. B. N. in Official Classification, carloads (See Note 2), from New Hamburg, N. Y., to C. N. E. Ry. stations, Matteawan, N. Y., to Verbank Village, N. Y., inclusive, $1.25 per ton of 2000 lb. Reason—Proposed rates are fairly comparable with rates from New Hamburg to Millerton and State Line, N. Y.

18507. (A) **Building lime**, carloads, minimum weight 30,000 lb. (B) **Agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb., also **ground limestone**, carloads, minimum weight 50,000 lb., from Shraders, Penn., to Scranton to Beach Haven, Penn., inclusive, (A) 15½c and (B) 14½c, and to Berwick to Northumberland, Penn., inclusive, (A) 12½c and (B) 12c per 100 lb. Reason—The proposed rates are comparable with rates now in force from Bellefonte and York, Penn., to same points of destination.

18510. (A) **Building lime**, carloads; (B) **Agricultural lime** (having no value for building or chemical purposes), carloads, minimum weight 30,000 lb., from Pancoast, Penn., to B. R. & P. Ry. stations; Beachtree, Clearfield, Ernest, Indiana, Punxsutawney, Bonnie Brook, Butler Transfer, Penn., and various, (A) rates ranging from 8c to 10½c, and (B) rates ranging from 7½c to 9½c per 100 lb. Reason—The proposed rates are comparable with rates from Buffalo, N. Y., Bellefonte, Penn., Pancoast, Penn., etc., on like commodities to points in the same general territory.

18511. **Sand** (other than blast, engine, foundry, glass, loam or molding) **and gravel**, carloads (See Note 2), from Point Marion, Penn., to destinations on the B. & O. R. R. in the state of West Virginia, not to exceed the following scale (rates are in cents per 2000 lb.):

	For single line haul	For joint line hauls
20 miles and under	60	80
40 miles and over 20	70	90
60 miles and over 40	80	100
80 miles and over 60	90	110
100 miles and over 80	100	120
125 miles and over 100	110	130
150 miles and over 125	120	140
175 miles and over 150	130	150
200 miles and over 175	140	160

ReasonProposed rates are in accordance with order of the I. C. C. in Docket No. 18940.

18526. **Sand** (other than blast, engine, fire, foundry, glass, molding, quartz, silex, silica and filter), carloads (See Note 2), from Mt. Holly Springs, Penn., 90c, and Reading, Penn., $1.25 per ton of 2000 lb. Reason—Proposed rates compare favorably with rates from Mt. Holly Springs to Hershey, Pine Grove, Lancaster, Penn., etc.

18530. (A) **Lime**, carloads, minimum weight 30,000 lb.; (B) **Ground limestone**, carloads, minimum weight 50,000 lb., from Ashcom, Penn., to points on the B. & A. R. R., C. N. E. R. R., C. Vt. Ry., B. & M. R. R., Me. Cent. Ry., Mont. & Wells River R. R., N. Y. N. H. & H. R. R., Grafton & Upton, and Rutland, R. R., (A) rates ranging from 22c to 28½c per 100 lb., and (B) rates ranging from 22c to 25c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Bellefonte and Pleasant Gap, Penn.

ILLINOIS FREIGHT ASSOCIATION DOCKET

2977C. **Limerock or limestone**, from Mosher and Ste. Genevieve, Mo., to stations in southern Illinois. To representative points—

	Pres.	Prop.		Pres.	Prop.
Caseyville	150	135	Belleville	150	126
Benton	150	110	Nashville	126	90
Herrin	150	122			

3718C. **Sand and gravel**, carloads, to establish commodity rate of 94c per ton of 2000 lb., from Lincoln, Ill., to C. S. & St. L. Ry. stations, viz.: Waverly, Hagaman, Medora and Jerseyville, Ill.

4411. To establish commodity rate of $1.08 per net ton on **sand and gravel** and $1.01 per net ton on **crushed stone**, carloads, from Joliet, Lemont and Millsdale, Ill., to Loami, Ill.

4411, Sub. 1. To establish commodity rate of $1.01 per net ton on **sand and gravel and crushed stone**, carloads, from Joliet, Lemont and Millsdale, Ill., to Mechanicsburg, Ill.

4414. **Agricultural limestone**, carloads, from Eldred, Ill., to stations on the C. B. & Q. R. R.:

To (representative points)—	Present per 100 lb.	Proposed per ton
Piasa, Ill.	9½	93
Medora, Ill.	8	93
Beardstown, Ill.	10	93

4415. **Sand**, carloads (See Note 3), but not less than 40,000 lb., from South Chicago, Ill., to Peoria, Ill. Rates per ton of 2000 lb. Present (1), 151c; proposed (2), 113c. (1) Applies on intrastate traffic only. (2) To apply on intrastate traffic only and no switching charges to be absorbed at either end.

4147, Sub. 1. **Sand** (except blast, core, engine, filter, etc.) **and gravel**, carloads, from Hollis, Ill., to Saunemin, Emington, Campus, Strawn and Cornell, Ill. Present, class rates; proposed, 101c per net ton.

SOUTHWESTERN FREIGHT BUREAU DOCKET

14608. **Marble**, from Tate, Ga., to points in Texas. To establish a rate of $8.52 per ton of 2000 lb. on **marble, ground or pulverized**, carloads, minimum weight 50,000 lb., from Tate, Ga., to Houston and Galveston, Tex., and points grouped therewith. Shippers of ground or pulverized marble at Tate, Ga., compete with the shippers of whitestone at Whitestone, Ga. They have directed attention to the rate of $8.52 per ton on whitestone from Whitestone, Ga., to the Houston-Galveston group and have requested the same rate on marble from Tate, Ga., pointing out that pulverized marble is used for the same purpose as powdered whitestone.

Foreign Abstracts and Patent Review

Effect of Low Temperatures and Freezing on the Strength of High Early Strength Portland Cement. The tests were carried out by Dr. A. Gessner at Prague. The effect of freezing was studied on 7-cm. cubes of 1:3 mortar, exposed to frost action 4 hours after mixing and kept at a temperature of —6 deg. C. for 5 days. The mortar had not set during this time. Further 2 days' curing at room temperature resulted in a compressive strength of 53.5 kg. per sq. cm., showing that the setting properties of the cement were not permanently impaired. Other tests covered the effect of sodium chloride and frost action after initial curing of 24 hours in the moist closet and 24 hours in water. The latter tests showed great resistance of high early strength portland cement after normal curing of 48 hours.

Curing conditions were greatly varied in studying the effect of low temperatures. Immediate exposure to temperatures of 0 to —5 deg. C. resulted in great reductions of strength.

The general conclusion was drawn that, while high early strength portland cements, similar to other portland cements, are subject to the effect of low temperatures and freezing, this effect is less pronounced due to the intensity of initial hardening. The strengths of high early strength portland cements exposed to frost action thus may still be above those of ordinary portland cements. High early strength portland cement is, therefore, particularly adapted for use under unfavorable temperature conditions.—*Zement* (1928), 10-12.

New Polish Cement Standards. The set should not begin before 40 minutes and should be complete in not more than 10 hours later. After 3 hours in the vapor bath the cement must be free of shrinkage cracks and warping.

Screen Tests. A maximum of 2% residue on 900-mesh (appr. 70 Tyler) and 20% on 4900 (appr. 170 Tyler).

Chemical Analysis.

Loss in ignition	3.0% max.
Insol.	1.5 max.
SO_3	2.5
MgO	3.0

Spec. Grav. Minimum of 3.3.

Tensile Strength. Minimum of 425 lb./in.^{2} for clean cement after 7 days in water. For 1:3 mixture 215 lb./in.^{2} after 7 days in water; after 28 days, 270 lb./in.^{2}.

Compressive Strength. 1:3 mixture after 7 days in water must be at least 2130 lb./in.^{2}; after 28 days, 3550 lb./in.^{2}.—*Zement* (1928), 180-185.

New Italian Cement Standards. New specifications were issued November 11, 1927.

Screen Test. 2% remaining upon 900-mesh (approx. 70-mesh, Tyler) and 20% upon 4900-mesh (approx. 170-mesh, Tyler).

Spec. Grav. 3.00.

Setting Time. Begin after 10 minutes, end after 30 minutes for quick-setting cement; begin after 1 hour, finish after 6-12 hours for normal-setting cement.

Strengths. The cements are divided into two grades:

1. QUALITY

Tensile strength after 7 days	285 lb./in.^{2}
Tensile strength after 28 days	355 lb./in.^{2}
Compressive strength after 7 days	3550 lb./in.^{2}
Compressive strength after 28 days	5670 lb./in.^{2}

2. QUALITY

Tensile strength after 7 days	255 lb./in.^{2}
Tensile strength after 28 days	310 lb./in.^{2}
Compressive strength after 7 days	2560 lb./in.^{2}
Compressive strength after 28 days	3550 lb./in.^{2}

—*Zement* (1928).

Japanese Cement Industry. Japan has 34 plants with an annual production capacity of 3,740,000 tons. New technical contrivances during the past 15 years have contributed much to the Japanese plants. For example, the average strength of the 1:3 mixture, after 7 days, is 4050 lb./in.^{2} as compared with 1840 lb./in.^{2} of 1913. During the same period of time the hydraulic modulus increased from 1.85 to 2.11. Rotary kilns are used exclusively in Japan.—*Zement* (1928), 222-223.

Reactivity of Solid Material. E. Kordes, assistant in the Silicate Research Institute, gives a compact report of previous investigations on the subject and shows that material in a crystallized state is capable of entering into chemical reaction. The atoms and molecules at higher temperatures possess a certain freedom of motion which, however, is not as great as in a liquid or gaseous condition.—*Zement* (1928), 94-98.

Strength of Asbestos Shingles. Tests were conducted by Dr. O. Kallauner of the German Institute for Silicate Research at Brünn to determine the flexural strength of parallel strips cut from the edges and from the center of asbestos shingles and the effect of size of specimens. From the experiments it was concluded that the relative position of the strips had no appreciable effect upon the flexual strength and that the width of strip as well as the spans used in the tests showed no appreciable effect on the flexural strength in kg./cm.^{2}. This evidences uniformity of the material in a "parallel" direction throughout the different sections of asbestos shingles and indicates that flexural strength tests may be conducted on whole shingles and on narrow wide strips without producing variation of results.—*Zement* (1928), 275-276.

Japanese Specifications for Portland Cement. The following specifications were issued:

Spec. Grav. At least 3.5.

Screen Tests. Not over 17% remaining upon 4900-mesh (approximately 170 Tyler mesh).

Setting Time. To begin not before an hour and to end not later than 10 hours.

Soundness Test. The cold water test and the boiling test (1½ hours) are specified.

TENSILE AND COMPRESSIVE STRENGTH

1:3 Mixture (by weight)

Tensile strength after 7 days	200 lb./in.^{2}
Tensile strength after 28 days	300 lb./in.^{2}
Compressive strength after 28 days	3000 lb./in.^{2}

Clean Cement

Tensile strength after 7 days	570 lb./in.^{2}

Chemical Analysis. Foreign materials not to exceed 2.5% MgO, 3.5%; SO_3, 2.0%; loss on ignition, 4.0%.—*Zement* (1928), 224.

Rotary Kiln and Its Operation. There is an idea that in a rotary kiln one is handling apparatus of huge dimensions, which can only be considered for operations on a large scale. That is not entirely true, however, since the same kilns accommodate processes of moderate size with the best of results, and small kilns of laboratory size are also used.

It has been proven that in most cases it is not necessary entirely to melt the material in order to bring about a desired reaction; frequently a softening at the beginning is sufficient since the reactivity and speed of the reaction are so great that further liquification is by no means necessary. The uses and possibilities for further developments are unusually numerous and by no means have they been fully explored.

The Charge—The regular feeding of the raw material into the rotary kiln is one of the most important parts of such a process; should irregularities occur, most unsatisfactory results follow. If the amount of raw material fed is in less than normal, or the feed is suspended, a falling off of the production occurs, and there is the danger of overheating because of the decrease in material passing through the combustion zone, thus affecting the process unfavorably. The mixture can, for example, liquify, or adhere to the walls of the kiln. On the other hand, if the addition of the material to the kiln is too rapid, too much material comes into the furnace per unit of time, it is cooled too quickly, the mass is not heated sufficiently and the temperature at which the maximum yield is obtained is not reached, especially in processes which absorb heat, as is usually the case. Small variations in the feeding have a very slight effect upon the yield since the kiln itself brings about a certain

adjustment before the material arrives at the combustion and sintering zone. An accidental break in the feeding, short of duration, does not signify an absolute cessation, but merely a slower filling of the furnace, since the pushing forward of the farther mass ceases. When feeding is resumed, this material progresses somewhat more quickly so that equalization is obtained within certain limits.

It is advantageous to have the raw material flow from a larger stock bin into a smaller one which can be thoroughly supervised by the foreman; from here it is led by some kind of a delivery tube into the kiln. This delivery contrivance must be capable of thorough regulation; the usual baffles for changing the number of turns do not suffice for delicate operations. A more sensitive means of regulation must be provided. It has been frequently observed that material well mixed in the stock bin later separated again. The wet process did not materialize the hoped for advantages, therefore, with respect to a uniform mixing, and the regulation by means of a sludge valve was no more exact than with a dry delivery. The maintenance of a constant degree of thickness in the sludge also offered decided difficulties.

In manufacturing with dry materials, it is of considerable advantage to insert after the delivery arrangement a piece of apparatus in which the material is so thoroughly moistened that it no longer gives rise to a powder when it falls into the kiln; for otherwise a considerable amount would be carried by the flue gases into the dust chamber and flue. It is, of course, desirable to reduce to a minimum the amount of powdered raw material entering the dust chamber. Water, therefore, is squirted up with a sprinkler in the dampening coil or drum, either with or without a stirrer. It is necessary to keep the path from stock bin to kiln short; as a result the supervision is easier and the regulation better.

The entry tube into the kiln consists of an iron tube as wide and steep as possible which is protected by a water cooled sheath in case the temperature of the waste gas is too high. It is unfortunate that this down pipe acts as a chimney, since part of the flue gas is drawn high into it and there causes considerable trouble. In the interest of the process it is not always possible to counteract this tendency through the suitable installation of flue dampers. Often it is desired to make further use of the waste gases. In such cases it is necessary to lead the mass directly into the kiln through a coil. This coil and tube must be so constructed that they are easily accessible and interchangeable, so that there is no great delay should crusts or deposits form for any reason which hinder the smooth entry.

Because of other practical considerations it is necessary that the kiln head remain easily accessible not only from the fire side, but also from the delivery side, so that the interior of the furnace can be observed from either side. It is only under such circumstances that exact temperature measurements and gas analyses can be made. The latter, especially, are of decisive significance for the correct placing of the oven, since, in order to carry through a desired process, a very definite composition of flue gases is necessary. *Abstract of article by Dr. Schuster from Chemiker-Zeitung* (1927), 667; 708.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Process for Cellular Structure Cementitious Material. Process consists of forming a pulp of hydraulic cement, water and a frothing flotation reagent, and agitating the pulp to a froth.—*G. B. Hinton, U. S. Patent No.* 1,657,716.

Making of Briquettes Containing Phosphate Rock. The process consists of making a substantially waterproof briquette by mixing about 6 parts ground phosphate rock, 2 parts pulverized coal and 2 parts silica, molding the briquette and heating to approximately red heat.—*J. A. Barr, assignor to Agr. Corp., U. S. Patent No.* 1,655,981.

Plaster Board. A board having a plaster core, margined by edge stratas of previously prepared composition having different characteristics than the core itself.—*M. K. Armstrong, U. S. Patent No.* 1,659,072.

Wall Board Edge. A plaster board, either side of which may be used as the exposed face due to the system of enveloping the core without overlapping of the covering paper.—*E. L. Gustafson, assignor to United States Gypsum Co., U. S. Patent No.* 1,665,168.

Hydrating Unit. The invention refers to a lime hydrator for the continuous hydration of lime from the raw limestone to the finished product.—*Hugh Miscampbell, U. S. Patent No.* 1,662,932.

Plaster-Board Walling. A plaster-board walling which is claimed to do away with the visible joint line through the finished interior surface by providing a wall board surface having a uniform absorptive rate at the joints as well as the rest of the surface. This is said to be accomplished by covering the abutting section of wall board with stub material possessing the same absorption rate. —*John Schumacher, U. S. Patent No.* 1,663,219.

Hardening and Aging Process for Calcined Gypsum Products. The process consists essentially of adding borax to gypsum during its calcination. It is claimed that an artificially aged gypsum possessing great strength is produced by the process, which is carried through the second boil.—*J. H. Colton, assignor to Pacific Portland Cement Co., U. S. Patent No.* 1,659,971.

Manufacture of Imitation-Marble Panels. The process consists of forming several layers of a plaster magnesite stucco having sprinkled mineral colors between each layer. The superimposed layers are then rolled up like a jelly roll, sliced transversely, placed in a suitable mold and smoothing the surface and blending the colors with a roller. The object of the invention is to provide an imitation marble surface.—*W. J. Schenk, U. S. Patent No.* 1,665,072.

Production of Magnesium Oxide. The process consists in treating dolomite with magnesium chloride to obtain magnesium oxide and calcium carbonate, involving the continuous reproduction of the magnesium chloride during the cycle of operation.—*William Koehler, U. S. Patent No.* 1,664,630.

Apparatus for Slaking Lime into Lime Putty. The apparatus is claimed to be an improvement in the process of slaking lime into lime putty. The apparatus consists of a curing vat having a bed of filter material at the bottom, in which are provided a network of porous drain conduits.—*D. A. Evans, assignor to Evans Lime Putty Co., U. S. Patent No.* 1,662,776.

Dust Collector. An apparatus to prevent loss, through the stacks of lime hydrators, of valuable products, such as lime dust, during the process of hydration. The device consists of a horizontal offset stack in which is placed an axial water supply pipe, parallel to the offset. Attached to this pipe are a number of small vertical pipes, tipped with spray nozzles. The water supply shaft is caused to rotate by means of a motor.—*H. Miscampbell, U. S. Patent No.* 1,650,292.

Rotary Drying Apparatus. The apparatus is of the rotary drum type which provides an intermediate mixing chamber which is claimed to intimately mix and disintegrate the partially dried material by causing it to pass through the drier at a non-uniform rate. —*H. A. Marston, U. S. Patent No.* 1,649,839.

Production of Porous Building Material. Method consists of covering all internal faces of the agitator, employed in producing porous building material, with a resilient coating to which crystals will not adhere and cause acceleration in the setting of the plaster of paris coming in contact with them. Crystals usually occur at eddies or points of interruption and this process is claimed to obviate their collection.—*G. M. Thomson, assignor to Penn. Gypsum Co., U. S. Patent No.* 1,660,280.

Wall Board. A plaster board covered with paper sheathing in which the sheating overlaps intermediate the edges instead of at the edges. It is claimed that in this way the edges will be completely enclosed and will not be weakened by a loose edge of paper. Another feature is the enclosing of a reinforcing margin joined to the composition by mechanical means.—*W. M. Jenkins, U. S. Patent No.* 1,659,877.

Oregon Governor Recommends State Discontinue Buying Cement

A RESOLUTION advocating the abolition of the present practice of having the state purchase cement for road contractors came before the state highway committee of Oregon recently. It was laid over until next meeting of the board.

The proposal to have the state discontinue purchase of cement for road contractors, submitted by Governor Hartley, revives his opposition to the plan long followed by the highway committee. The governor declared that it was "contrary to good business," as it compels the state to finance contractors and frequently results in payments on contracts before such payments are due, which, he held, was contrary to law.

The governor said that the practice prevents price competition in the sale of cement for highway purposes and enables "certain manufacturers to maintain a price monoply, resulting in a loss rather than a saving to the state." He stated further that the state under this system "has paid for the cost of keeping the cement company's books and telegraph bills and contractors' cement orders and has served to make the state a sales and collection agency for the manufacturers of portland cement."—*Olympia* (Wash.) *Olympian.*

(Governor Hartley evidently overlooks the fact that the saving in distribution and sales costs is reflected in the price of cement and is a saving to the people of Oregon, not the cement manufacturers.)

Ash Grove Lime and Portland Cement Co.'s "Quickard"

"QUICKARD," the early high strength cement manufactured by the Ash Grove Lime and Portland Cement Co. at its Chanute, Kan., plant, is described in recently received pamphlets issued by the company. Reports of tests made by three laboratories show how rapidly the hardening goes on. The report of the company's own laboratory shows initial set in 3 hr. and final set in 6 hr. 15 m. The fineness is reported as 94.6% through 200-mesh.

Several tests on tensile and compressive strengths by different laboratories are quoted. The company's own tests, which are as conservative as any, show:

TENSILE STRENGTH
1:3 Standard Sand Briquettes
Pounds per square inch

	1 day	2 days	3 days	5 days	7 days	28 days
	375	445	466	485	495	535
	360	430	460	435	540	545
	345	425	440	475	485	520
Av.	360	433	455	465	506	534

COMPRESSIVE STRENGTH
1:3 Standard Sand—2x4-in. Cylinders
Pounds per square inch

	1 day	2 days	3 days	5 days	7 days	28 days
	2832	3183	4130	4233	4551	5697
	2705	3246	4170	4361	4836	5605
Av.	2769	3214	4154	4297	4694	5661

The company has also issued specifications for high early strength concrete. They differ from the usual specifications only in those sections relating to the cement, the time the concrete may be held before placing and the time of curing. The sections relating to these things are:

"The cement shall conform to the physical and chemical requirements of the Standard Specifications and Tests for Portland Cement prescribed by the A. S. T. M. (serial designation C 9-26) with subsequent additions and amendments thereto, and in addition shall attain in 24 hours the strength specified for portland cement at 28 days, or when mixed with the aggregates to be used, the resulting concrete shall attain in 24 hours the strength specified for portland cement concrete using the same aggregates at 28 days.

* * * * *

"Concrete shall be mixed only in such quantities as are required for immediate use and any which has developed initial set or has been mixed longer than 30 m. shall not be used.

* * * * *

"The use of central mixing plants and the transportation of the mixed concrete to the work will be permitted, provided there is no segregation of the concrete when it arrives at the point where it is to be used, and provided that the period of time elapsing from the time the concrete is mixed until it is dumped in the work does not exceed 30 m.

* * * * *

"The curing shall be done by the same methods provided in the standard specifications up to 24 hours, after placement of the concrete. If wet burlap is used, it may be left on the concrete throughout the 24-hour period, in lieu of using other methods after the concrete has taken final set, if desired. No curing will be required after the end of the 24-hour period."

The specifications further state that the concrete need not be protected from the cold for more than 24 hours and that after 24 hours it may be opened to traffic or put to any use for which it is intended.

Ideal Cement Company Brings in an Oil Well

THE Ideal Cement Co.'s well at Ada, Okla., produced 168 barrels of oil in 24 hours, according to figures given out at the offices of the company in Denver. No official announcement has been made with regard to further development of the 240 acres owned by the company near Ada. With the discovery well producing at its present rate, however, the company is in a position to make further tests on the structure. Oil was encountered in the hole when the cement company was drilling for water to supply its plant—*Florence* (Colo.) *Citizen.*

Canada Cement Corp. to Enlarge Winnipeg Plant

A $1,000,000 expenditure by the Winnipeg plant of the Canada Cement Co., Ltd., is the first result to the proposed Flin-Floa mine development in the month. An announcement was made by F. S. Kilbourne, general superintendent of the company at Montreal, that the work would be proceeded with immediately, provided satisfactory arrangements could be made with the Manitoba government.—*Westminster* (B. C.) *Columbian.*

Marquette Cement Plans New Mill at Oglesby, Ill.

THE Marquette Cement Manufacturing Co., Chicago, has announced plans for the construction of a modern plant adjacent to their present plant at Oglesby, Ill., near La Salle. The new mill will have an annual capacity of 2,000,000 bbl. The company states that the development is undertaken at this time in anticipation of a large demand for its product in Chicago and the middle west. The completion of this plant will mean that the Marquette company will then have an annual production from their mills in Illinois of more than 5,000,000 bbl. It is planned to supply material to the new plant from the quarries now being operated for the present plant.

Arkansas Portland to Begin Construction

ACCORDING to local reports, M. O. Matthews, Ada, Okla., has announced that the Arkansas Portland Cement Co. is to begin construction of its plant near Schal, Howard county, Ark., at once. J. W. Dawson, of Texarkana, has surveyed the line for the four-mile railroad that will connect the plant with Schal and has also made the survey for the highway that will connect with the Saratoga-Mineral Springs highway. The plant will have a capacity for 3000 bbl. daily. The company is one of the Beottcher enterprises (Colorado and Ideal) of Denver, Colo.

Coplay Cement Co. Elects Directors

AT a recent meeting of the stockholders of the Coplay Cement Manufacturing Co., Coplay, Penn., the following directors were chosen: E. Blum, J. J. Burns, L. H. Burton, A. Israel, S. Kohn, L. M. Loeb, M. Mayer, M. S. Steiner, B. J. Weil, W. J. Wolf and H. Woolever. The company's officers are: Chairman, Eugene Blum; president, Herbert E. Steiner; vice-presidents, Abraham Israel and Sol Kuhn; secretary-treasurer, Lee Burton.—*Allentown* (Penn.) *News and Item.*

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

A Good Example of the Gravity System Cement Products Plant

Well-Planned Plant of Edgar D. Otto, at Downers Grove, Ill., Produces a Wide Variety of Products

IN recent years there has been a constant movement toward new and efficient plants among the manufacturers of concrete products. Those producers who followed this movement have, in the main, prospered, while the manufacturers who declined to discard primitive methods have, on the other hand, found the going consistently harder with each new year. In the suburban territory surrounding Chicago, one of the important plants—that of Edgar D. Otto at Downers Grove—is a fine example of the new efficiency. Mr. Otto first started operating a small block plant at Westmont, not far from Downers Grove, in conjunction with his main business of contracting, about five years ago. After four years in the Westmont plant, it became evident that the cement products portion of the business could remain simply a side-line in the relatively inefficient plant there, or it could become a leader in some new and well-designed factory. The step was taken and the new plant was constructed at the east edge of Downers Grove. After about one year's operation, it is entirely obvious that the move has been fully justified by the steady increase in the demand for all types of units produced at the factory.

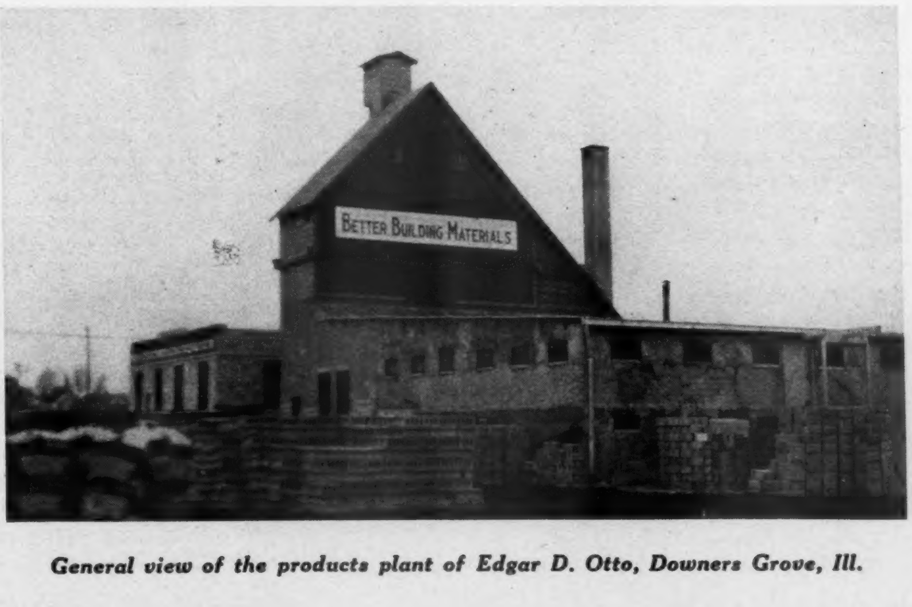
The plant is well situated beside the main line of the C. B. & Q. R. R., and on one of the paved streets of the town, thus insuring ease in obtaining material and distributing the products. Since the suburban towns along the C. B. & Q. are practically continuous from the Chicago limits to some distance beyond Downers Grove, and since all these towns are grawing rapidly, it is obvious that the Otto plant has a decidedly good field to serve. Besides the towns along the C. B. & Q., there are other western suburbs near by, connected for the most part by hard roads, affording an additional market. And as many of the products manufactured at the plant are used in municipal improvement work, it is easy to understand that a good market among the subdividers is also to be found.

A Gravity Layout

The plant has been designed throughout for convenience and efficiency. The layout uses the gravity system entirely for the flow of material through the factory, laregly eliminating the necessity for elevators or for manual handling of the material. The cinders, sand and gravel, and crushed stone are unloaded into a hopper at the foot of an enclosed 8-in. bucket elevator from trucks or from railroad cars on the stub-end siding which terminates at this point. The material drops to the boot of the elevator and is carried to the top of the plant to the bins. There are four bins here, with the single chute from the head of the elevator branching in three ways to reach the bins. Gates stop the flow to two branches when material is passing down the third to the bin below. The bin for screenings, farthest to the east and holding 25 cu. yd., is filled by the same chute that fills the bin for pea gravel, which holds 40 cu. yd. Here again is another gate to divert the material in the chute to one or the other bin. The largest bin of all, having a capacity of about 100 cu. yd., is directly below the head of the elevator, and is used for cinders. An unusual feature here is the screening in the under side of the chute which permits the small cinders to drop into the bin, but automatically screens out the large pieces and clinkers and carries them away from the bin, to be used for building roadways around the plant yard and for similar work. The last bin is used for torpedo sand and holds 40 cu. yd.

Mixing Equipment

On the second floor of the plant, and directly beneath the bins, is an I-beam on which moves a 14-ft. Besser batch box. Gates from the bins above permit the



General view of the products plant of Edgar D. Otto, Downers Grove, Ill.

placing of the required amount of each kind of material in the box as it moves along below the bins. The box can then be emptied into either of the three mixers, which are also located on the second floor. The mixer to the east, which supplies material to the stripper on the floor below, is a 14-ft. Besser machine. The west mixer is a Blystone having a capacity of 9 ft., while the center mixer is a ½-bag, wet-mix, barrel mixer. The Blystone furnishes material to the face-down block

Mixer on second floor of plant

machine on the first floor, and the barrel mixer is used to supply material for the work on the second floor, where such special pieces as catch basin block and manhole rings are made. There is also a chute from the 9-ft. mixer which takes the material away from the face-down machine, when desired, and carries it to the small center hand machines on the first floor used for making other special products.

There is an ingenious home-made elevator for raising bags of cement from the first floor storage space to the second floor, beside the mixer, where they can be conveniently reached by the man in charge of the mix. This elevator has a capacity of 15 bags at one time, and the bags are left on the elevator until used, thus avoiding an extra handling of the cement. After the cement is emptied into the mix, the sacks are piled near the mixers, but each pile separately, so that at the end of the day an accurate check is had on the cement used and the batches mixed by each of the machines.

On the first floor, directly below the east and west mixers, are a Besser stripper and a Besser face-down block

Conveyor to overhead bins

machine, respectively. These machines are served by two tracks each, and there are two tracks also serving the hand machines between the two large machines. These tracks take the kiln cars to a cross track a few feet away, where a transport car takes the cars to the tracks leading into the kilns.

Curing the Products

The kilns are directly south of the cross

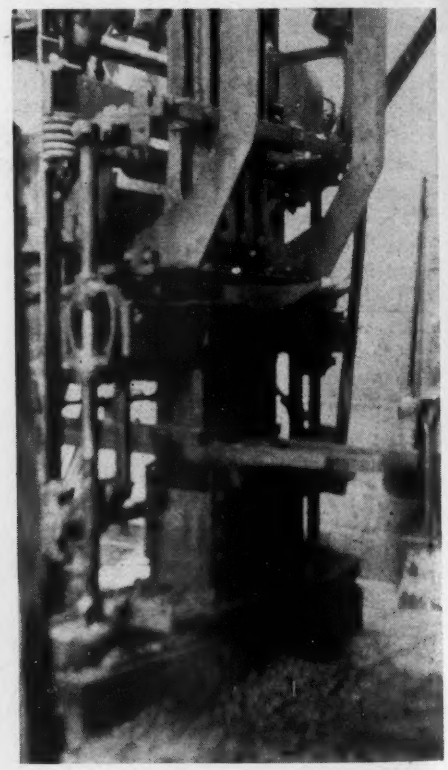
Elevator for cement

track, or opposite to the position of the block machines, so that the least possible movement is required to get a car from the machine to the kiln. There are nine kilns in all, three having been built when a recent addition was placed on the plant. Each kiln is 33 ft. by 7½ ft., and is 6 ft. 2 in. high. They each contain two kiln tracks, and are furnished with live steam pipes. There is a 4-in. reinforced concrete slab above the kilns, forming the floor of the large second floor room where most of the specialized products are made.

In curing the block, 40 hours is allowed in the steam rooms. At the end of that time they are transferred to the outside storage yard, where they remain for at least another 28 days.

Power is supplied throughout the plant by a 20-hp. Fairbanks-Morse motor which runs the main drive shaft. This in turn furnishes power, by means of belts, to the three mixers and the two power machines and to any other machines that may be attached to the line shaft.

The daily output at this plant of the



Block machine

standard pieces runs about 1600 blocks or a little better. This includes approximately 1300 blocks on the stripper and around 400 per day on the face-down machine. Block are made 8x8x16-in., 8x10x16-in., and 8x12x16-in. Besides plain block on the stripper, cinder block and rock-face block are produced on the face-down machine.

Numerous Specialties Produced

Besides the regular block, numerous specialties are made in the large room

immediately above the kilns. It is in the wide variety of its manufactures that the Otto plant finds much of the popularity of its products. Almost anything in the way of a fireproof building unit may be obtained here. The wide range includes chimney caps, window sills, water tables, and lintels for house construction. It includes manhole blocks and rings, catch basin block, rings and traps, and other similar pieces. It is the intention of the company to be in position to furnish every type of modern building construction unit—except lumber—that can be furnished. To accomplish this the company carries a line of metal lath, steel lintels, steel sash, T wall ties, and reinforcing. While these can in no sense be coupled with cement products manufacture, they are used in conjunction with work using cement products, and the convenience of obtaining them from the same plant has created a good demand. As a convenience, lime is also carried in stock for use in construction. (It should be noted here that Mr. Otto is still actively engaged in the contracting business and this supply of a wide variety of material is no doubt of a real service for him.) Besides this complete line of fireproof building material, the plant also turns out such ornamental products as bird baths and lawn seats, for which a good trade has readily been built up.

Reinforced concrete pipe is also produced at the plant. Ten-inch, 12-in. and 15-in. are the usual sizes, the length of all being 3 ft. The pieces are produced in forms with a wet mix.

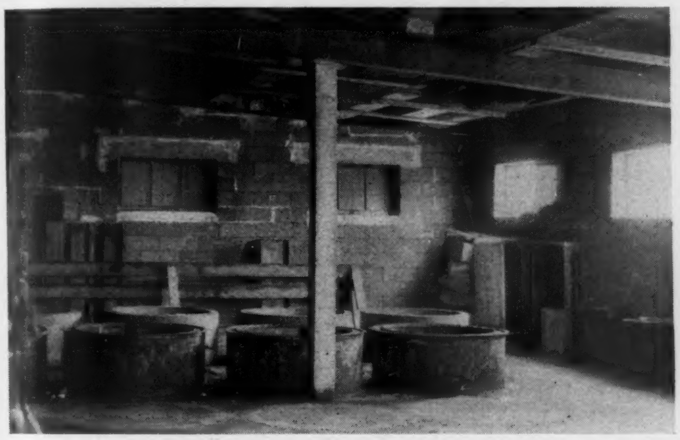
Use Own Products

Both the new factory and the office adjacent are built of block produced by the company. The high chimney of the plant is also of block manufactured by the company. Ambler corrugated roofing is used on the factory, making the whole thing of fireproof construction. Recently an addition to the east has been added which includes three more kilns, a garage and a boiler room. Over the new kilns is a large space which is not yet needed for production purposes, and so is leased to a window curtain producer. In this way it was possible to allow for future expansion and yet have space which is at present bringing in an additional revenue. In the new boiler room is a Brownell boiler for heating the plant and supplying steam to the kilns. The large room over the kilns is heated by a "Comet" unit heater, made by the New York Blower Co. Throughout the new plant all of the plumbing was done by the company at a considerable saving of expense, since the work could be done at odd times. At the same time much more complete and satisfactory plumbing has been installed than if it had been left to be done as a single job by a plumber on contract.

Six or seven men are generally employed in the plant. Two men are at work on the stripper and one man takes care of all three mixers. In summer two men generally are placed on the face-down machine, while in winter only one man is used here. Two men are used for moving the kiln cars and for work around the yard.

Edgar D. Otto is president of the company and M. G. Binder is the superintendent. Mr. Otto is by training a structural engineer, and has been engaged in contracting work along this line for some time. He is a graduate of the Chicago Technical College. Mr. Otto was formerly mayor of Downers Grove, where he made a fine record with a constructive and businesslike administration. Mr. Binder, the superintendent, takes care of the selling portion of the business as well as directing the operation of the plant. The company maintains a complete modern office in a newly constructed building adjacent to the plant. One clerk is employed to care for the work here.

Distribution of the products is practically entirely by truck. One 2½-ton International truck is owned for this work, as well as to bring material to the plant.



Forms of some of the special products

Offices of the plant demonstrate use of products

British Book on Cement Products and Cast Stone

A NEW British book on the production of cement products, "Manufacture and Uses of Concrete Products and Cast Stone," has recently been received. The work covers the subject comprehensively, laying particular emphasis on cast stone products and the more specialized pieces. The book discusses fully the selection and proportioning of the materials, and their mixing and tamping. Considerable attention is paid to the water content, or water cement ratio. There is also a complete discussion of the curing of products. One of the most noticeable points about the book is the completeness and excellency of the illustrations, covering every phase of the subject. Especially are the cuts showing the finish of various types of surfaces noteworthy. These include several cuts in color, showing with remarkable clearness the color and texture which can be obtained through the use of a variety of different materials.

The book is the work of H. L. Childe, well known in the products field in England. It is published by the Concrete Publications, Ltd., of London.

Canadian Association Elects Officers

THE Concrete Products Association of Canada has elected the following officers:

President, J. H. Henderson, Granite Concrete Block Co., Ltd., Toronto; first vice-president, R. J. McClelland, Kingston, Ont.; second vice-president, T. W. Bishop, Ridgeville, Ont.; secretary, H. W. Thompson, Toronto; treasurer, E. W. Harper, Toronto.

Board of Directors—A. Cartan, Fairbank Block and Supply Co., Ltd., Toronto, Ont.; W. J. McCann, Toronto Builders' Supply Co., Ltd., Toronto; E. S. Johns, Crystalite Stone Products, Hamilton; representative, Canada Cement Corp., Ltd.; representative, Alfred Rogers Co.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.		1.30	1.10	1.00	1.00	
Frederick, Mo.	.50@ .75	1.35@1.45	1.15@1.25	1.10@1.20	1.05@1.15	1.05@1.10
Ft. Spring, W. Va.	.35	1.30	1.30	1.25	1.20	1.15
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.80	1.50		.95	.90	
Walford, Penn.			1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.			.50	.50	.50	1.50
Alton, Ill.	1.85		1.85			
Columbia and Krause, Ill.	.90@1.25	.80@1.35	1.00@1.35	.90@1.35	.90@1.35	
Cypress, Ill.	1.00@1.25	1.00@1.25	1.20@1.25	1.20@1.25	1.20@1.25	1.35
Dubuque, Iowa (h)	.80	1.00	1.35	1.35	1.35	1.35
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.00	1.00
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa (f)	1.10	1.55	1.55	1.35	1.45	1.45
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.		.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Northern Ohio Points	.85@1.10	1.25	1.15	1.10	1.05	1.05
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	
Stone City, Iowa	.75		1.10	1.05	1.00	1.00
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20			1.75		1.75
Waukesha, Wis.		.90	.90	.90	.90	.90
Wisconsin Points	.50		1.00	.90	.90	
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	
Chico, Texas	1.00	1.30	1.25	1.20	1.10	1.05
Crystal River, Fla.	.50		1.75	1.75	1.50	
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	
Rock Hill, St. Louis, Mo.	1.00	1.25	1.00@1.25	.90@1.25	.90@1.25	.90@1.25
Sugar Creek, Mo.	.75	1.00	1.20	1.20	1.20	1.20

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35		1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	
Duluth, Minn.	.90@1.00	2.25	1.75	1.55	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.35@1.40	2.00@2.10	1.80@1.90	1.40@1.50	1.40@1.50	
Richmond, Calif.	.75		1.00	1.00	1.00	
Spring Valley, Calif.	.75	1.10	1.10	1.10	1.10	
Springfield, N. J.	1.60	2.10	2.00	1.60	1.60	
Toronto, Canad (m)		5.80	4.05	4.05		
Westfield, Mass.	.60	1.50	'.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	
Cayce, S. C.—Granite	.50	2.00	1.80	1.80	1.65	
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00		2.35			
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	
Middlebrook, Mo.	3.00@3.50		2.00@2.25	2.00@2.25		1.25@3.00
Richmond, Calif.—Quartzite	.75		1.00	1.00	1.00	
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.			1.30	1.25	1.20	1.20

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .80. (p) Carload prices. (q) Crusher run, 1.40; screenings for ¼-in. granolithic finish, 3.00.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 200 mesh	6.00
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh	1.50
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; 50-90% thru 4 mesh	1.25
50-90% thru 100 mesh	1.35
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags	4.25
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh	1.50
Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 5% $MaCO_3$; 90% thru 50 mesh, bulk	3.50
100-lb. paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25, 15 days.)	
Dundas. Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.00
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Linwood, Iowa—Analysis, 98% $CaCO_3$, 1.10% or less $MgCO_3$; 100% thru 4 mesh	1.10
50% thru 50 mesh	1.10
100% thru 20 mesh, sacked, sacks extra	9.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.35
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	.90@1.50

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill. — Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 95% thru 100 mesh; paper bags	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75@ 2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.35
Ohlton, Ohio	3.00
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.00@ 2.50
Ground glass sand, 140 mesh	8.00@12.00
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75@ 1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@1.00
Estill Springs and Sewanee, Tenn.	1.35@1.50	1.35@1.50
Ohlton, Ohio	*2.25	*2.25
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60	1.45			1.40	
Machias Jct., N. Y.	.85	.65	.65		.65	.65
Montoursville, Penn.	1.00	.80	.75	.65	.65	.60
Northern New Jersey	.50	.50	1.25		1.25	
Portland, Me.		1.00	2.25			2.00
Somerset, Penn.		2.00				
Washington, D. C.	.50@ .55	.50@ .55	1.20	1.20	1.00	1.00
CENTRAL:						
Attica, Ind.	All sizes .75@.85					
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@ .80	.50@ .70	.10@ .40	.50@ .70	.60@ .80	.60@ .80
Barton, Wis.		.55	.75	.75	.75	.75
Chicago District	1.30*@1.50*‡			1.50*@2.00*‡		.25*
Columbus, Ohio¶		.85	.85	.85	.85	
Des Moines, Iowa		.40		1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.50	.50	.65		.95	
Elkhart Lake, Wis.	.60	.30	.50	.56	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00		1.00	
Hersey, Mich.		.50		.60	.70	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45g		.60@1.25h	.70@1.25	1.25c
Mason City, Iowa		.50	.85	1.30	1.25	1.25
Mattoon, Ill.	.75@.85 all sizes					
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35		1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.85	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
SOUTHERN:						
Brewster, Fla.			3.00			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.	River sand and gravel, all sizes, 1.40					
Eustis, Fla.	.45@ .50					
Ft. Worth, Texas	1.09	1.09	1.00	1.25	1.25	1.25
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.10
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.15@ .25	.10@ .20	1.00@1.25	.65@ .85	.50@ .65	.50@ .65
WESTERN:						
Kansas City, Mo.	.70	.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Otay, Calif.		.35@ .50	.60	.60	.60	.60
Phoenix, Ariz.	1.25	1.00	1.50	1.25	1.10	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.	Dust to 3 in., .40					
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Burnside, Conn.		.75				
Des Moines, Iowa	.60					
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Fls., Wis					.65	
Ft. Worth, Texas						.80
Gainesville, Texas					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		.50
Indianapolis, Ind.	Mixed gravel for concrete work, at .65					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.	Mine run gravel, 1.55 per ton					
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramec River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.10			4.00	
Beach City, Ohio	1.75@2.00	1.75@2.00		1.75	1.75@2.00		
Dresden, Ohio	1.25@1.50	1.25@1.50	1.50@1.75	1.00@1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30@ .35			
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.25	1.25					
Ohlton, Ohio (b)	2.25	2.25	2.50	2.00	1.75	2.25	2.25
Ottawa, Ill.	1.25	1.50	1.25	3.25	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Pottery sand, 8.00@12.00						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*@2.00	1.50*@2.00		1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Washed and screened, not dried. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Lime Ridge, Penn.							5.00[2]	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.			8.50@9.00		7.00	8.50[22]	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[6]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.00	8.00				8.00	
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio[6]	11.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Scioto, Ohio		8.00	8.00	8.50	8.25	.62½	7.50	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50@ 8.00	7.50@ 8.00	12.50	8.00	10.00[9]	9.00	1.50[8]
SOUTHERN:								
El Paso, Texas							7.00	
Frederick, Md.		8.00@9.50	8.00@9.50			9.50[15]	7.00[15]	
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	19.25	8.50	8.50	8.50			7.00	1.25
Ocala, Fla.		10.00	9.00				10.00	1.40
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	16.00		16.00	16.00			16.00	
San Francisco, Calif.	19.50	16.00	13.00	19.50	14.50	.80	14.50	1.85
Tehachapi, Calif.[13]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [15] To 8.00. [22] To 9.00. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel crayons, gross	1.00@ 2.80
Chatsworth, Ga:	
Crude talc (for grinding)	5.00
Ground talc (20-50 mesh), bags	7.50
Ground talc (150-200 mesh), bags	10.00
Pencils and steel crayons, gross	1.00@ 2.00
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.00@ 9.50
Same, burlap bags, bags extra	8.00@ 8.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5.00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags; 325 mesh	14.75
200 mesh	13.75
Glendon, N. C.:	
Ground talc (150-200 mesh), bulk	6.00@10.00
Ground talc (150-200 mesh), bags	8.00@14.00
Pencils and steel crayons, gross	1.05@ 2.00
Blanks, .08 per lb.; cubes	50.00
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bags	8.50@14.75
Joliet, Ill.:	
Ground talc (150-200 mesh) in bags:	
California white	30.00
Southern white	20.00
Dark	10.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	3.75@ 4.00
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)
(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50@24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		9.00@10.00
Easton, Penn.—Green stucco		12.00@18.00
Green granite		14.00@20.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		11.00@18.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		4.00@ 5.50
Phillipsburg, N. J.—Royal green granite		15.00@18.00
Randville, Mich.—Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		12.00@20.00
Tuckahoe, N. Y.—Tuckahoe white	10.00	
Warren, N. H.		¶7.90@‖8.95
Wauwatosa, Wis.		20.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 16.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.
¶C.L. ‖L.C.L.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.18%; Na_2O, 1.65%; SiO_2, 64.65%; Fe_2O_3, .08%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50; bulk	11.50
Pulverized, 95% thru 200 mesh; bags, 19.73@23.50; bulk	18.63@20.00
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
"Imperial" feldspar, 200 mesh; bags, 23.50; bulk	22.50
"Riverside" spar, 200 mesh; bags, 17.60@20.00; bulk, in quantity	13.65
20% thru 80 mesh; bags, 17.60@20.00; bulk, in quantity	13.65
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk (Bags 15c extra.)	18.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone	‡7.50@*9.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton, including sacks	15.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*
Farmington, Conn.	13.00
Flint, Mich.	¶11.50@19.00c
Factory jobs, f.o.b. plant, net	13.25
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@18.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	16.00*
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50b
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	13.50@16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M, 10th of month. (b) Red, $16. (c) Less than 2000, 5% discount, delivered; more than 2000, 10% and 5% discount, delivered.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	84¼	3.37
Atlanta, Ga.	....	2.35
Baltimore, Md.	....	2.15‡@2.25
Birmingham, Ala.	....	2.10
Boston, Mass.	....	2.13@2.23
Buffalo, N. Y.	....	2.00‡@2.10
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	....	2.24
Charleston, S. C.	....	[illegible]
Cheyenne, Wyo.	.64	2.56
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio	....	2.22
Cleveland, Ohio	....	2.24
Columbus, Ohio	....	2.22
Dallas, Texas	....	2.00
Davenport, Iowa	....	2.24
Dayton, Ohio	....	2.24
Denver, Colo.	.63¾	2.55
Des Moines, Iowa	....	2.05
Detroit, Mich.	....	1.90
Duluth, Minn.	....	2.04
Houston, Texas	....	2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.	....	2.10
Jacksonville, Fla.	....	2.20
Jersey City, N. J.	....	2.03‡@2.13
Kansas City, Mo.	....	1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.	....	2.10
Milwaukee, Wis.	....	2.20
Minneapolis, Minn.	....	2.12@2.22
Montreal, Que.	....	1.60
New Orleans, La.	....	2.07
New York, N. Y.	....	1.93‡@2.03
Norfolk, Va.	....	2.07
Oklahoma City, Okla.	....	2.46
Omaha, Neb.	....	2.36
Peoria, Ill.	....	2.22
Philadelphia, Penn.	....	2.11‡@2.21
Phoenix, Ariz.	....	3.26
Pittsburgh, Penn.	....	2.04
Portland, Colo.	....	2.80
Portland, Ore.	....	2.40‡@2.60
Reno, Nev.	....	2.91
Richmond, Va.	....	2.24‡@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	....	2.51
Savannah, Ga.	....	2.50
St. Louis, Mo.	....	1.95
St. Paul, Minn.	....	2.12@2.22
Seattle, Wash.	....	2.50†@2.65
Tampa, Fla.	....	2.25
Toledo, Ohio	....	2.20
Topeka, Kan.	....	2.41
Tulsa, Okla.	....	2.33
Wheeling, W. Va.	....	2.12
Winston-Salem, N. C.	....	2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.	....	1.80
Chattanooga, Tenn.	....	2.45*
Concrete, Wash.	....	2.60
Davenport, Calif.	....	2.45*
Hannibal, Mo.	....	1.90
Hudson, N. Y.	....	1.75
Leeds, Ala.	....	1.65
Lime and Oswego, Ore.	....	2.90‡
Mildred, Kan.	....	2.35
Nazareth, Penn.	....	2.15
Northampton, Penn.	....	1.75
Richard City, Tenn.	....	2.05
Steelton, Minn.	....	1.85
Toledo, Ohio	....	2.20
Universal, Penn.	....	1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks.
†10c discount, 10 days. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x36". Per M Sq. Ft.	⅜x32x36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	....	....	....	....	11.70u	....	....	....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	....	....	13.50	....	....	....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	....	....	....	....	14.30o	12.30m	....	m9.00@11.00o	....	....	....	....	....
Delawanna, N. J.	....	....	....	....	....	....	....	7.25	....	....	13.00	14.00	....
Douglas, Ariz.	....	....	6.00	14.50	15.00	....	18.00	....	30.00	....	....	....	....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	....	24.55	20.00	....	....	....
Gypsum, Ohio	3.00	4.00	6.00	7.00	9.00	9.00	19.00	7.00	24.50	19.00	....	15.00	25.00
Los Angeles, Calif.	....	....	7.50@9.50	11.50y	....	....	....	....	....	....	....	....	....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	....	20.00	30.00
Portland, Colo.	....	....	....	10.00	....	....	....	....	....	....	....	....	....
San Francisco, Calif.	....	....	9.00	13.40	14.40	....	15.40	....	....	....	....	....	....
Seattle, Wash.	6.60	10.00	10.00	13.00	....	....	....	....	....	....	....	....	....
Sigurd, Utah	....	....	....	....	....	....	....	....	21.50	....	....	....	....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes: 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	....	....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	16.00	....	....
Detroit, Mich. (d)	.16	....	.18
Forest Park, Ill.	21.00*	....	....
Grand Rapids, Mich.	15.00*	....	....
Graettinger, Iowa	.16@ .18	....	....
Indianapolis, Ind.	.10@ .12a	....	....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Oak Park, Ill.	18.00*	23.00*	30.00*
Olivia and Mankato, Minn.	9.50b	....	....
Somerset, Penn.	.18@ .20	....	....
Tiskilwa, Ill.	.16@ .18†	....	....
Yakima, Wash.	20.00*	....	....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50

†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Columbus, Ohio:	
5x8x12	6.50
Grand Rapids, Mich.:	
5x8x12	8.00
Longview, Wash.:	
4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Oak Park, Ill. (Haydite):	Per 100
4x8x16	15.00
8x8x16	22.00
8x12x16	30.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
	Each
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Clinker	11.00	....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00@16.00	19.00@40.00
Mt. Pleasant, N. Y.	....	14.00@ 23.00
Oak Park, Ill.	....	37.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@ 55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	18.00	30.00@35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.	15.00 per ton																
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	......	.19	.28	.43	.55½	.90	1.30	......	1.70†	2.20	......	......	......	......	......	......	......
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15	......	......	1.60	......	2.50	......	......	......	......	......
Longview, Wash.	Sewer pipe 40% off list; culvert—list																
Mankato, Minn. (b)	......	......	......	......	......	......	......		......	1.50	1.75	2.50	3.25	4.25	......	......	......
Newark, N. J.	6 in. to 24 in., $18.00 per ton																
Norfolk, Neb. (b)	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Olivia, Mankato, Minn.	12.00 per ton																
Paullina, Iowa‡	......	......	......	......	......	......	......	2.25	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Somerset, Penn.	......	......	......	......	1.08	1.25	1.65	......	......	2.50	......	3.65	4.85	7.50	8.50	......	......
Tiskilwa, Ill. (rein.)	......	......	......	.75	.85	.95	1.20	1.70	......	2.00	......	2.75	3.40	......	6.50	......	......
Wahoo, Neb. (b)	......	......	......	......	1.00	1.13	1.10	1.60	......	1.90	......	2.25	3.40	......	5.50	......	......
Yakima, Wash.							1.42	......	......	2.11	......	2.75	3.58	4.62	6.14	6.96	7.78
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	......	......	......	......	......	......	......	......	......	......

(a) 24-in. lengths; (b) Reinforced.
†21-in. diam. ‡Price per 2-ft. length.

Recent Contract Prices for Rock Products

CONTRACTS recently let on bids received for rock products are as follows:

Billings, Mont.—J. M. Carter was awarded contract recently for gravelling road between Billings and Huntley, Mont. Mr. Carter was low bidder at $1.10 a cubic yard.

Erie, Penn.—Nickel Plate Sand and Gravel Co. received a contract to furnish 2,500 tons of gravel to the city at $1.05 a ton.

Lewiston, Ida.—Quinn Brothers of Boise, Ida., received contract from district commissioners for crushing and spreading gravel on lateral roads at $1.58 per cu. yd.

New Concrete Products Plant for Chattanooga

THE Sherman Concrete Pipe Co. of Knoxville has announced that work will be started immediately on the construction of a new branch plant at Chattanooga, Tenn. The new plant is to have a capacity production of 100 tons of pipe a day. The Sherman company was recently awarded a contract by the city of Chattanooga..

New Cement Products Company to Be Organized

A COMPANY is being organized at Nogales, Ariz., for the manufacture of tufa cement blocks, according to a recent report from that city. The promoters believe they will be in the market early this fall. It is said that the value of tufa, which is a substance of volcanic origin, as a building material was not fully recognized until the completion of the Los Angeles viaduct, which was built with tufa cement. Nogales is said to be the greatest tufa district in the world.—*Nogales* (Ariz.) *International.*

American Refractories Meeting

THE annual meeting of the American Refractories Institute will be held at White Sulphur Springs, Va., Tuesday, May 8. The important feature of the meeting will be the discussion of a select list of specifications used by consumers at the present time for the purchase of refractories. Two papers, "Screening of Fire Clays" and "The Cause of Bulging in Hand-Made Shapes," are to be presented at the meeting.

Fort Scott, Kan., Cement Plant Makes Improvements

THE Fort Scott Hydraulic Cement Co. is making improvements in its plant, adding to its storage facilities and newly equipping its laboratory, according to the *Fort Scott* (Kan.) *Tribune*.

The same paper says that the plant is among the oldest in the Middle West, as it was started in 1867. The cement is made by burning a natural cement rock, which is reported to contain about 60% of lime and grinding somewhat finer than portland cement is ground. In addition to the ordinary uses to which cement is put, the paper says that a considerable quantity is being used as an admixture with portland cement to make a denser concrete.

Illinois Commerce Chamber Asks for Cement Tariff

ENACTMENT of a tariff to halt cement imports was asked recently in a letter to Illinois congressmen from John H. Camlin of Rockford, president of the Illinois Chamber of Commerce.

Thousands of Illinois workers, employed by cement mills and other industries which contribute materials and services to the cement manufacturers, face loss of employment because the American seaboard is being flooded with imported cement, he said.

In outlining the dilemma of the mid-west cement manufacturers, Mr. Camlin revealed a unique situation in the marketing problems of the producers. Although the imported cement cannot compete directly with the mid-west manufacturers, except at the borders of their natural selling territory, the cut-throat competition of the foreign producers at ocean ports has forced the eastern, Gulf coast and Pacific producers to turn to inland markets.

Development of the cement industry in several foreign countries, notably Belgium, in which wage scales and living standards are far below the American level, has alarmed the mid-west manufacturers, who are likely to bear the brunt of the unchecked importations.—*Chicago* (Ill.) *Post.*

Wagner Quarries Co. Begins Lake Shipments of Stone

THE WAGNER QUARRIES CO., of Sandusky, Ohio, began shipment of stone from its new dock at Sandusky on April 12. The first boat was loaded by a locomotive crane, but a loading system is building.

A large hopper is being built at the center of the dock over which railroad cars will pass. Two cars may be dumped at the same time. A conveyor which will handle 700 tons per hour will carry the stone to the vessel.

The first shipment was consigned to the Ayres Co., Detroit, as part of a 60,000-ton order. It is expected that more than 500,000 tons will be shipped from the new dock this year.—*Sandusky* (Ohio) *Register.*

H. A. Schaffer Made Eastern Sales Manager of Bates Valve Bag Corp.

H. A. SCHAFFER, for the past nine years conservation engineer of the Portland Cement Association, is now associated with the Bates Valve Bag Corp. as eastern sales manager.

Mr. Schaffer has exceptional qualifications for his new work, having been identified in various capacities with the cement industry for over 30 years. First as chief chemist of the Vulcanite Portland Cement Co. and later as chief chemist and manager of the Northampton Portland Cement Co., he became widely known among mill executives as an authority on portland cement production.

From 1914 to 1928, he was a member of

H. A. Schaffer

the firm of Harrison and Schaffer, consulting engineers, specializing in mill engineering and chemical problems. In 1918, he was called to Washington to take a position on the War Industries Board as assistant to the director, Building Materials Division.

Shortly after the war, Mr. Schaffer joined the Portland Cement Association as conservation engineer, in which connection he and his staff conducted studies that have effected great improvements in labor efficiency and mechanical problems in member plants and also made a survey of processes in the leading mills of the United States, Canada, England and Continental Europe. Mr. Schaffer is a member of the Western Society of Engineers and the American Chemical Society.

The Bates offices in New York City and Nazareth, Penn., will be headquarters for Mr. Schaffer in his new capacity.

U. S. Gypsum Extending Plant at Sweetwater, Texas

IN accordance with its recent general expansion program, the United States Gypsum Co. of Chicago is making large extensions to its plant at Sweetwater, Texas, according to a recent report in the *Dallas* (Tex.) *News*. The improvements will cost in the neighborhood of $350,000, it is stated.

Two More Cities Bar Foreign Cement

SAVANNAH, Ga., and Miami, Fla., are reported to have recently barred the use of foreign cement in public works. The *Manufacturers Record* says concerning this that foreign interests have made determined efforts to induce the city councils of these cities to permit foreign cement to be used, but in both cases the city councils refused to rescind the order.

California Portland Installs Large Kilns and Silos

THE California Portland Cement Co. has recently installed two large kilns in the place of small kilns and added greatly to its storage capacity at its plant at Colton, Calif., according to the *San Bernadino* (Calif.) *Sun*, which says:

The two big items in the present program of improvement are the installation of two kilns and the erection of eight silos. The kilns are now being put in place. They are 10x204 ft. and are supported by steel and concrete foundations.

The silos form a new feature of the plant and are designed to increase the efficiency in the manufacture of the cement. Work on these containers is beginning. Each will be 32 ft. in circumference and stand 65 ft. high. They will contain 14,000 tons of raw mix.

The additions to the plant will be completed in May, it was announced by Ernest E. Duque, general manager of the company. The new features of the plant are not designed to increase production but to increase efficiency.

The new kilns replace five smaller kilns installed in 1908. The plant will now have nine large kilns.

The new units of the plant will be connected with the Fleming dust collector, a device installed a number of years ago. The dust is conveyed into chambers where it is washed. The particles of dust are picked up by the moisture of the steam and thus prevented from escaping into the atmosphere.

The dust has been turned into valuable by-products. After it is dried it is sold as fertilizer. A shipment of 2000 tons of this dust is being made to the Italian Vineyard Co. for use as fertilizer.

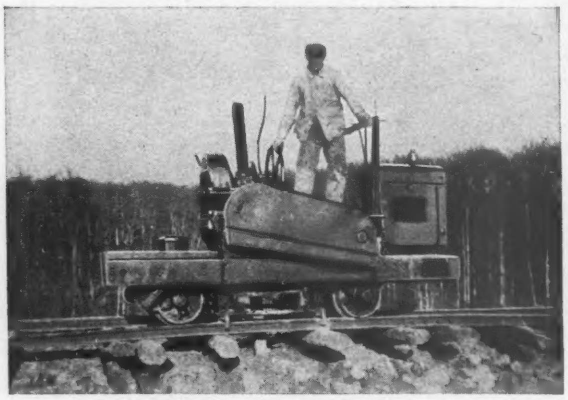
Hauling of clay from Reche canyon has started, the company having recently shifted its clay operations from Orange county to San Bernardino county. The Triangle Rock and Gravel Co. of San Bernardino is operating a fleet of seven trucks and has installed a power shovel at the Reche canyon deposit to dig the clay as was told in the last issue of ROCK PRODUCTS. The California Portland's plant at Colton is one of the largest in the country, producing 12,000 bbl. daily. Its office is in the Pacific Mutual building, Los Angeles.

New Machinery and Equipment

New Shifter for Narrow-Gage Track

THE NORDBERG MANUFACTURING CO., Milwaukee, Wis., announces a new "Model C" track shifter for use on narrow gage. This new shifter is the result of the success of the standard gage shifter which the company has been producing for the past three years, according to the manufacturers, who say that there has been considerable demand for a narrow gage machine similar to the large "Model N." The new machine can be used on track as 36-in. gage.

The principle of operation of the "Model C" is the same as that of the standard machine, but due to a less severe service and smaller dimensions, it has been possible to simplify the controls and decrease the weight in comparison with the larger machine. It is powered by a 4-cylinder, 15-hp., fully-enclosed gasoline unit. There are two propelling speeds in either direction—a low of 4½ miles an hour and a high of 13. The worm-driven lighting mechanism has a lifting capacity of 42,000 lb. at a maximum lifting speed of 15 ft. per minute, it is claimed. The frame is made of 8-in. channels with all the joints welded. The shifter has a width of 5 ft. 5 in., length of 12 ft. 1 in. and a wheel base of 5 ft. 5 in.



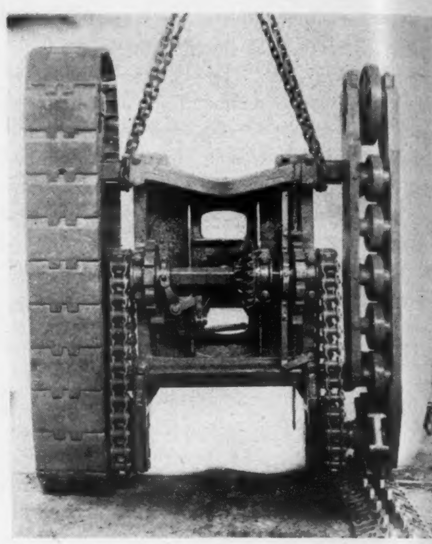
Track shifter for use on narrow gage

Power for the various functions of the machine is supplied through friction disc clutches. Any clutch to be in service must be held in by the operator—that is, when the clutch is released, it is automatically disengaged. This arrangement permits a much faster performance, the manufacturers claim, as it enables the securing of greater accuracy in the various movements of the machine when shifting and raising track. While this machine is principally for shifting work, it can also be used for raising track by lifting one rail at a time, it is said, thus dispensing with the track gang and speeding up any track raising job. The manufacturers say that the small machine will perform well on fills and loose material, and that mud, sand, cinders, slag or similar material is not a hindrance.

New Revolving Gasoline Shovel

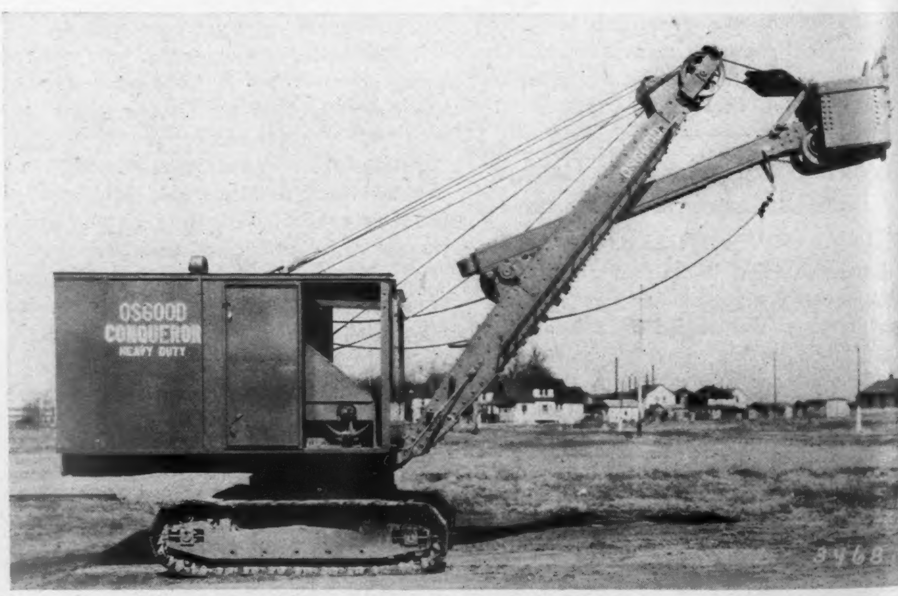
THE OSGOOD CO., Marion, Ohio, has placed on the market a new gasoline shovel of the full revolving type which is easily convertible for dragline, back hoe, clamshell and crane service. This shovel is mounted upon a new continuous tread truck frame of the double chain drive type. The machine, as a shovel, carries a minimum length boom of 20-ft. and a handle of 15-ft., with a back hitch type dipper, and for crane service it carries a 45-ft. boom of the structural lattice bow type, with built-in tagline and with a fairlead for dragline service self-adjusting to any angle of the boom.

In changing this shovel, which is known as the "Conqueror," from shovel to clamshell, back hoe or dragline service, no additions or changes are necessary in the operating machinery. According to the manufacturers, the only changes required are those involved in changing the boom assemblies, and this work may be done in the field in a few hours' time with ordinary plant labor.



View of truck of new revolving shovel, showing gearing

An 80-hp., 6-cylinder gasoline motor is mounted at the rear of the machine on the unit steel main body frame casting. Heavy unit steel side frames securely attached to the main body coating support the drum shaft and the reversing shaft, thus assuring complete alignment nad a minimum of vibration, it is claimed. A feature of the shovel is the combination cast iron gasoline tank and counterweight which is set into the deck at the rear of the motor. This arrangement saves space, reduces the fire hazard and eliminates the necessity of a gasoline pump, it is claimed. The tank will hold about 75 gal-



New full-revolving gasoline shovel

lons, which is said to be usually enough for a two-day supply.

The motor is equipped with a large 6-cell, 12-volt, 112-ampere-hour storage battery, electric starter, voltage regulator, gasoline filter, Pomona air cleaner and muffler. The Osgood "Servo" mechanism for setting the clutches on the hoisting and hold-back drums is retained on the new shovel, as is the application of the wire rope crowd which has been used on Osgood equipment for years. The wire rope crowd is self-adjusting to various boom angles, and is claimed to add greatly to the ease of operation.

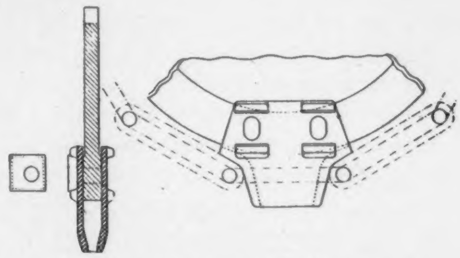
New Lightweight Portable Conveyor

LINK-BELT CO., Chicago, has announced a new portable conveyor which is light enough so that one man can move it easily and quickly. This new "Jax" conveyor has been built with rugged construction, it is claimed, yet is designed throughout for lightness of weight and simplicity of design. The 12-ft. conveyor, mounted on agricultural-type wheels of 14-in. diameter and 2-in. face, weighs only 640 lb. complete with the motor. The 15-ft. conveyor, with the same equipment, weighs 710 lb.

The frame of the conveyor consists of two heavy pipes tied together at the head and foot ends by electric steel castings. The casting at the head end provides a base for the motor, and a grease-tight enclosed housing in which the cut reduction gears operate. All shafts are provided with anti-friction bearings. It is claimed that lubrication is seldom necessary, due to the anti-friction bearings and because all gears run in a bath of grease. The height of the discharge point of the conveyor can be adjusted by moving the wheels forward or backward along the conveyor frame. The wheels are also provided with three positions for vertical adjustment. The simplicity of design and construction of the conveyor, together with the economy of quantity production, permits its sale at a low price, the manufacturers say.

New Expansible Sprocket

UNION CHAIN AND MFG. CO., Sandusky, Ohio, has recently developed a new expansible sprocket for prolonging the life of sprocket chains and for maintaining the efficiency of the chains in operation during their entire life. This sprocket has teeth which are adjustable to accommodate the natural wear which causes elongation in the chain. This elongation, though small in one link, is multiplied by the number of links engaged by the sprocket at one time, causing a misfit between chain ands procket and consequent noisy and jerky action.



Drawing of one tooth of new expansible sprocket

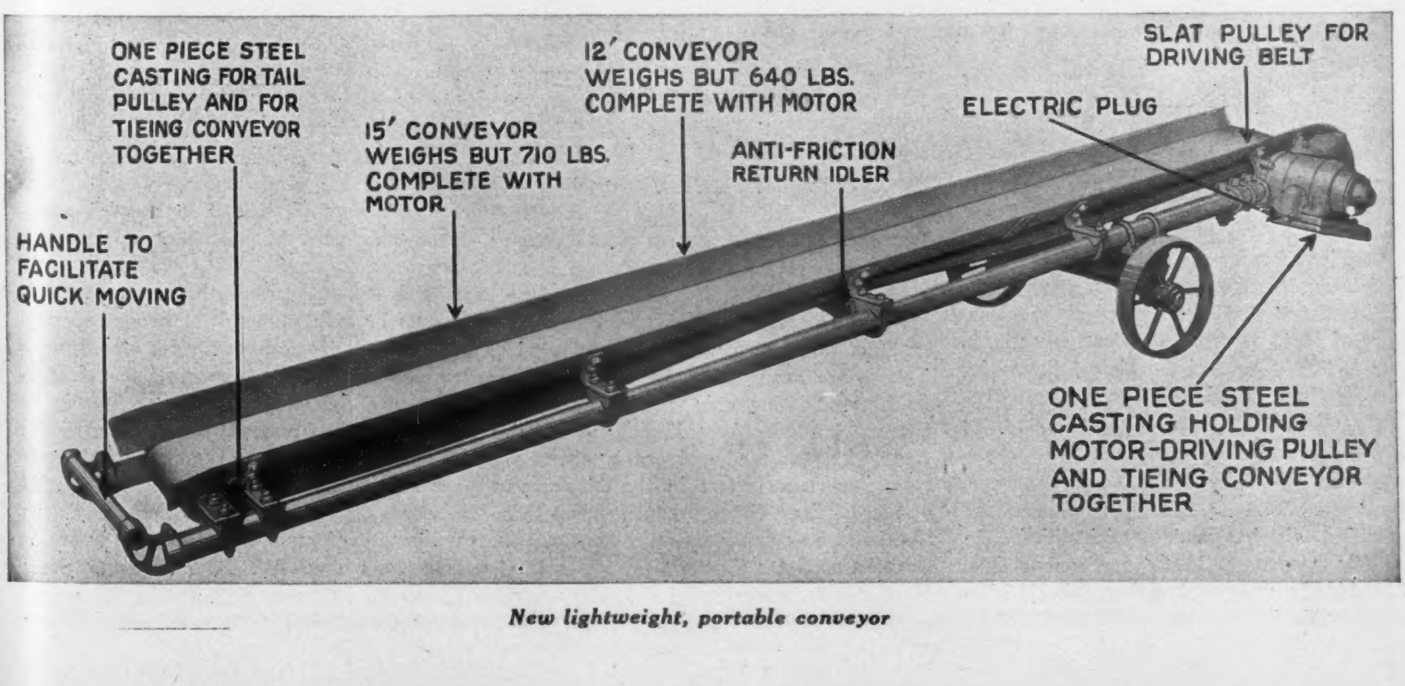
In this new sprocket, both sides of the body rim are machined to insure true running and to receive the teeth which straddle and are firmly clamped to the rim. Turned bolts, closely fitted in the rim, project through elongated holes in the teeth, the latter being secured relatively to pitch diameter, by means of square, beveled-edge, adjusting blocks fitted between lugs on the teeth. Holes are jig-drilled through the blocks at four points different distances from the edges, and when the blocks are mounted on the bolts the pitch diameter of the sprocket is governed by the arrangement of the blocks. When the chain is to be adjusted, after it has elongated beyond a proper fit on the sprocket, the nuts are released and the eccentric blocks readjusted so as to expand the teeth to a next larger pitch diameter. This takes but a few minutes to perform and is usually required only at long intervals, the wear and consequent elongation of the chain being greatly retarded by maintaining its proper fit on the sprocket, according to the company's claim.

This sprocket also has the advantage of affording teeth which may be readily changed when the wear is too great. It is also noted that the body of the sprocket will hardly wear out, so that the new sprocket is actually a permanent installation, it is claimed.

New Automatic Gas Mixer

A RECENT announcement by the Waukesha Motor Co., Waukesha, Wis., states that the company is now marketing a new automatic compensating gas mixer for internal combustion engines. It is stated that this device was designed to satisfy a demand for a new gas-proportioning device for use in the oil industry, where much of the power used in the production of oil is derived from natural gas. The gas engine is a simple means of converting this to efficient power.

The new device, which bears the trade name of "Gaspower," handles with equal facility still, natural or artificial gas, and offers an exceptional degree of control, it is claimed. According to the manufacturers, its principal features are its responsiveness, as it is claimed that it instantly and automatically proportions the fuel and air at each change of speed or load, its economy derived from correct mixtures over a wide range of demands, its elimination of the volume tank, its satisfactory operation under low gas pressures and its elimination of hair trigger adjustments. The device is being used exclusively on Waukesha "Recordo Head" power equipment.



New lightweight, portable conveyor

Commonwealth Silica Co. Resumes Operation

THE Commonwealth Silica Co. of Ottawa, Ill., has resumed operations after having been shut down for about three years. This concern produces green silica sand for molding purposes. A new steam shovel will be added to the quarry equipment and a crushing plant will be built. C. E. Saylor is manager of the company.

New England Material Dealers Adopt Resolution on Gypsum

AT the recent directors' meeting of the New England Builders' Supply Association, Alfred L. Merigold, of the Whittemore Co., and Dennis F. O'Connell, J. P. O'Connell Co., both of Boston, and Morris S. Sheketoff, of the American Cement Co., Hartford, Conn., were nominated to represent the New England Association on the National directorate.

The meeting adopted resolutions against trucking gypsum and plaster products direct to jobs from manufacturers' warehouses, and against sales of materials by manufacturers on a consignment basis. The directors also adopted resolutions opposing manufacturers of gypsum products maintaining warehouses in Boston or other places except for storage of specialties.

Permit Imported Gravel

THE state of Washington has a rule that only the products of the state shall be used in the construction of state highways. Recently, however, the highway commission put the rule aside and permitted the importation of sand and gravel from Victoria, B. C., for a highway near Blaine. The reason given was that trucking the material from Bellingham would interfere with the traffic on an already crowded highway.

Chico Stone Company Files Bankruptcy

VOLUNTARY petition of bankruptcy and order of reference and adjustment of an indebtedness of $162,045.70 was filed by the Chico Stone Products Co. over the signature of E. C. Dodson, president, recently, in the District Court of the United States for the Northern District of Texas.

Schedules filed with the petition disclosed properties valued at $467,119.48. Debts of the company listed were: Taxes and debts due the United States, $2,313.07; taxes due states, counties, districts and municipalities, $7,178.03; wages, $3,100.59; secured claims, $103,142.75; unsecured claims, $46,211.26.—*Dallas* (Texas) *News.*

Mining Engineers' Committee on Nonmetallics

THE following have been elected members of the nonmetallic minerals committee of the American Institute of Mining and Metallurgical Engineers: Oliver Bowles, chairman; W. M. Weigel, vice-chairman; Arthur C. Avril, secretary.

General Committee—L. K. Armstrong, Charles H. Behre, Jr., Hoyt S. Gale, Frank C. Hooper, R. W. Hyde, Robert Linton, Frank P. Knight, R. B. Ladoo, G. R. Mansfield, Heinrich Ries, N. C. Rockwood.

Crushed Stone, Sand and Gravel—A. T. Goldbeck, chairman; Arthur C. Avril, G. F. Loughlin, J. R. Thoenen, W. M. Weigel.

Cement—John J. Porter, chairman; S. Warren Hartwell, R. J. Colony, W. R. Dunn.

Lime and Gypsum—H. E. Brookby, chairman; N. J. Brown, W. M. Myers, Frank A. Wilder.

Refractories—George A. Bole, chairman; W. H. Fitch, C. R. Forbes, E. L. Messler, Kenneth Seaver.

New York Aggregate Producers Consider Credit Plan

COMMITTEES representing the New York Highway Chapter of the Associated General Contractors, the New York State Crushed Stone Association and the Empire State Sand and Gravel Association met at Albany, April 10, to work out a uniform credit system to govern the sale of aggregates to be used in public improvements in the state.

After considerable discussion it was planned that a discount of 10 cents per ton should be allowed for payment on or before the tenth of the month after shipment, but that this should not apply to those who had not paid the prior month's account by the fifteenth.

This plan is being submitted to the associations represented. The Empire State Sand and Gravel Association and the New York State Crushed Stone Association considered it in meetings held in Syracuse, April 27.

Mission, Texas, Sand and Gravel Plants Expand

THE Mission Sand Co. and the Crystal Sand Co., both new plants near Mission, Texas, are reported to be installing new machinery and increasing production to meet a heavy demand. According to the *Mission Enterprise,* the sand and gravel plants are most important factors in the development of the district. Other producers than those mentioned are: Havana Gravel Co., La Joya Gravel Co., Starr County Gravel Co., F. G Harden and Abney Gravel Co. All are reported working to capacity.

Aggregates for Concrete Highways

THE whole scheme that we are discussing (the use of the water-cement ratio method for designing highway concrete) presupposes that the materials are clean, structurally sound and of standard quality. To this end we test the cement, fine and coarse aggregate, and in some cases the water. At present we are relying upon the modified Deval abrasion test to give us an idea of the acceptability of the stone or gravel.

Someone at some time conceived the idea that the measurement of the quality of sand for concrete could be carried out by the comparison of its strength tested in a certain way with a standard sand tested under the same conditions. We believe that this manner of testing is absolutely wrong and without foundation in theory or test. Just so long as the sand under test is coarser than the standard sand we should expect to get as high or higher results.

For nearly a year we have been making up mortar specimens of sand using a water-cement ratio of 0.90. We start with a certain amount of cement, to which is added the amount of water which will give this water-ratio. When this is thoroughly mixed, enough sand is added to give a flow of 200, using a flow-table designed by the Bureau of Public Roads. Two-inch cube molds are then filled and after storage in a damp atmosphere for 24 hours are stored in water for 6 and 27 days longer. At the end of this time these are broken. In order to be classed as a normal sand the cubes should not break at less than 1800 lb. per sq. in. in 7 days, nor less than 3000 lb. per sq. in. in 28 days. Sands showing a strength of less than these figures would be classed as weak.

On the basis of the sand being normal, we would advise the engineer that this sand would be satisfactory for use in concrete, allowing the use of 5½ gal. of water to the bag of cement. If the sand showed low strength we would advise that not over 5 gal. be used. By cutting down the allowance of water we would thereby cut down the yield. Under ordinary conditions this fact would discourage its use.

We take the position that under the proper conditions any clean, and we would emphasize the word clean, and structurally sound sand may be used in the manufacture of concrete.

It is our experience that concrete roads should be built of nothing but washed sand and gravel or clean crushed rock. Such a recommendation has been made to our commissioner for all future work. The extra cost for washed material is small, but results in quality and economy of the finished product are great. When an unwashed material is used it is almost impossible to maintain uniformity of product as well as to keep it free from dirt.—W. F. Purrington, New Hampshire Engineer of Tests, in *Roads and Streets.*

News of All the Industry

Incorporations

Lone Star Cement Co., Wilmington, Penn., 100,000 shares common, no par value.

Midland Cement Products Co., Inc., Midland, Tex., $1,000.

Clearwater Lime Products Co., Orofino, Ida., $500,000.

Midland Cement Products, Inc., Midland, Tex., $1,000.

Gulf Gravel Co., Houston, Tex., $40,000. W. L. Pearson, Mary L. Brammer, H. S. Wilder.

Alabama Mica Co., Inc., Birmingham, Ala., $50,000. R. T. Clayton, Birmingham.

H. Miscampbell Co., Wilmington, Del., $200,000. Treating of limestone and other minerals.

National Refractories, Ltd., Montreal, Que., has been granted a federal charter with an authorized capital of $100,000.

Super Cement Co., Wilmington, Del., 2000 shares no par value. J. V. Pumm, E. M. MacFarland, of Philadelphia; R. L. Spurgeon, Wilmington, Del.

Wisconsin Silica Co., Westfield, Wis., 250 shares at $100 each. J. O. Mortenson, J. A. Conant, B. R. Crockett.

Grant County Gravel and Sand Co., Marion. Ind., filed papers increasing the capital stock, $20,000 preferred.

Architectural Stone Co., Chicago, Ill., $10,000. Manufacture and deal in stone, brick, lime, cement, etc. J. Solary, H. S. Gustafson and H. A. Friis.

Bedford Limestone Corp., Bloomington, Ind., filed papers recently, changing its location to Bedford, Ind.; also filed papers reducing its capital stock to 10 shares, no par value.

Glen Lake Cut Stone Co., Chicago, Ill., $15,000. Manufacture and deal in lime, limestone, plaster, cement, etc. P. S. Johnson, F. B. Eckstrom, E. E. Gellin.

Muskego Washed Sand and Gravel Co., Muskego, Wis., 100 shares at $100 each. Quarry and sell sand, stone and gravel. H. Divvert, W. Stein, F. Petroske.

Credit Valley Quarries, Ltd., Toronto, Ont., have been incorporated with a capital of $50,000 to carry on the business of quarry owners and operators and stone merchants.

Manitoba Marble Quarries, Ltd., Winnipeg. Man., has been granted a federal charter with an authorized capital of 2,000,000 shares of no par value.

Williford Crushed Stone Co., Memphis, Tenn., entered state of Arkansas. H. C. Martin, Williford, Ark., is agent. The company will use all of its capital stock, $50,000 in the state.

Shaw Stone and Ballast Co., Chicago, Ill.. $14,000 preferred, $6,000 common. Manufacture and deal in rock, stone and other mineral products. Correspondent: Dawson, Dawson & Schneiberger, First National Bank Bldg., Chicago, Ill.

Superior Gravel Co., Ltd., Toronto, Ont., capital stock, $500,000. Vice-president, Ralph Connable, Toronto; second vice-president, E. A. Campbell, of Kalamazoo, Mich; managing director, P. D. Hoel, Kalamazoo, Mich; secretary-treasurer, W. E. Rowe, St. Thomas, Ont.; Robt. D. Gordon, who will direct the company's sales policies. The president has not yet been elected.

Quarries

Miami Station rock quarry, Miami Station, Mo., reported to have resumed operations.

Bethany, Mo. The city rock quarry reported to have been reopened recently.

Santa Fe Railroad has opened its stone quarry near Cheraw, Colo.

Folsom State Prison, Calif., has installed a $10,000 rock crusher. The rock will be used on the state highways.

Le Grand, Iowa. Stone crushing plant reported to begin operations in the near future on the Coffin farm in this vicinity.

J. M. Snouffer, Dublin, Ohio, contractor, recently purchased the quarry property, located near Dublin, from D. C. Jones of Worthington, Ohio.

Connecticut Valley Trap Rock Co., Inc., Hartford, Conn., was sold at public sale. E. F. Sharples, New Haven, Conn., has acquired the plant and is said to be planning improvements.

Eureka Stone Quarry, near Wheeling, W. Va., is reported to be installing new machinery. The stones being made at this new quarry are to be shipped to the pulp mills in the north.

France Stone Co., Toledo, Ohio, have leased 40 acres of land close to the city of Kenton, Ohio, for a municipal airport. It is reported that officials of the company are considering the advisability of using the airplane as a means of transportation to their plants and quarries in Ohio.

Sand and Gravel

Crystal Sand Co., Mission, Tex., reported to be acquired recently by E. L. Bayse, Houston, Tex.

Huntington Sand and Gravel Co., Huntington, L. I., have recently installed sand washing equipment.

Roquemere Gravel Co., Montgomery, Ala., has recently increased its Florida holdings near the Escambia county line.

Roy Hooton is making improvements and additions to his gravel plant on Brandywine creek, Greenfield, Ind.

Twin Rivers Sand and Gravel Co., Walnut Ridge, Ark., has recently completed the installation of an 8-in. gravel pump and additional barges.

Troy, Kan.—Work has been recently started in Troy to gravel an 18-mile stretch of road in the vicinity. Gravel is being hauled into Troy at the rate of 10 carloads daily.

Frank J. Boland, Binghamton, N. Y., is reported to have purchased a deposit near Chenango Bridge, N. Y., on which he will build a plant for truck delivery.

Bellvue Sand and Gravel Co., Bellvue, Iowa, recently purchased gravel property in the vicinity for $14,000. The company, which is now shipping about 16 carloads daily, plans to enlarge their capacity.

Madison Sand and Gravel Corp. has installed a car system at its plant at Solsville, N. Y., to extend its digging operations. A field conveyor has transported all the material from the bank to the plant up to this time.

Lansing, Mich. It is reported that the city may consider taking gravel from its own property unless the cost proves prohibitive. The high price of gravel set in bids by Lansing gravel men is said to be the cause of the action.

Geary County, Kan. Need of a sand producing plant for the county was explained at a recent meeting of the Junction City Booster Club. Plans for road improvements in the near future would warrant such a plant, it was said.

St. Helens Sand and Gravel Co., St. Helens, Ky., filed a voluntary petition in bankruptcy in the federal court recently. The petition listed assets totaling $30,096.78 and liabilities totaling $28,322.55.

Walker Ross Sand and Gravel Co., Sumas, B. C., has recently been sold to Gilley Brothers of Vancouver. Mr. Ross has operated the plant at the mouth of the Sumas river for several years and it is said that the river bed at this point contains an extensive supply of sand and gravel.

Great Meadows, N. J. A sand and gravel company was recently organized at Great Meadows by Goble Bros. and Morgan Bros. of Great Meadows and J. E. Fleming of Vienna, N. J. They have leased what is known as the Merrell gravel banks near Great Meadows railroad station.

La Grange, Mo. The state gravel pit in this vicinity was recently opened for business. New equipment, including two barges, has been added which will enable the pumping of gravel from the bottom of the lakes formed by the removal of the gravel. C. E. Jackson, La Grange, is local manager.

Kaw Valley Drainage Board, Kansas City, Kan., recently ordered a temporary shutdown of its sand plant. The plant was closed because the board felt it inadvisable to buy some $15,000 worth of necessary equipment until the supreme court has rendered its decision on the legality of the statute allowing the drainage board to operate the plant.

Cement

Pennsylvania-Dixie Cement Corp. is reported to be working out a dust-prevention system for its Kingsport, Penn., plant.

Rapid City, S. D. The state cement plant has been opened for the season. Approximately 100 men will be employed, according to present operating schedule.

Alpha Portland Cement Co., Ironton, Ohio, resumed production recently. The plant had been idle for some time while orders were being filled from store bins.

Carolina Cement Co. Construction of spur tracks to the site of the New Bern, N. C., project of the Carolina Cement Co., can now be started, it is reported, following the leasing of rights-of-way.

Atlas Portland Cement Co., New York City, announced recently that their No. 2 mill at Northampton, Penn., would resume work at capacity production.

Alabama State Highway Department recently awarded contracts for 345,000 bbl. of cement to the six companies having plants within the state. The order was divided on a pro rata basis.

Pennsylvania-Dixie Cement Corp. has placed two new kilns in operation at its Richard City, Tenn., plant. Each kiln measures 10 to 11 ft. 3 in. by 343 ft. 9 in. and weighs 1,300,000 lb. complete with machinery.

Lehigh Portland Cement Co.'s quarry at Metaline Falls, Wash., will be the scene of a 20-ton shot early in May. The company fires one big shot each year to keep the plant busy during the working season. The largest shot fired in previous years contained 16 tons of dynamite.

Cement Products

Merritt Concrete Products Co., San Jose, Calif., manufacturers of concrete pipe, etc., will build a new plant at Oakfield, Calif., to cost about $50,000 with equipment.

The Bent Concrete Pipe Co., Los Angeles, Cal., has recently leased a waterfront tract in East Oakland, Cal., on which it will establish a plant for manufacture of high pressure concrete pipe, the initial investment to be $75,000.

Flagler County, Fla. Arrangements were recently made through the county agent's office for a meeting of local dairymen with a representative of the Portland Cement Association. The purpose of the meeting was to discuss the costs of constructing various types of silos.

Agricultural Limestone

Solvay Sales Corp. have announced the removal of their Chicago branch office to 222 W. Adams St., Chicago, Ill.

Iowa. Reported, that Iowa farmers will use 245,000 tons of limestone this year, or nearly five times as much as they used three years ago. The 245,000 tons of limestone were ordered by 13,000 farmers.

Kentucky. Old limestone fences in the blue-grass region are being torn up and pulverized for agricultural use in the state. It is said that the soil, under cultivation for 150 years, has grown acid for want of lime.

Gypsum

United States Gypsum Co., it is reported, have recently filed suit in Circuit Court for an injunction to prevent the Cook county, Ill., treasurer from attempting to collect 1925 taxes assessed against their capital stock for $343,900.

Silica Sand

Magnolia Bottle Co., Bristow, Okla., is reported running at capacity with a year's work ahead.

Silica Sand Co., Silica, Ohio, was damaged recently, according to reports, when a fire broke out in the frame sand drier building. No estimate of loss was given.

Miscellaneous Rock Products

Skagit Talc Mining and Refining Co., Seattle, Wash., will begin operators near Sedro-Woolley. The initial activities include the construction of a two-mile tram line for the transportation of talc to the railroad.

Banner Rock Products Co., Alexandria, Ind., recently commenced operations of wool-blowing in their No. 2 plant, located here. The run was in the nature of a test for newly installed equipment and was reported as successful.

Alabama-Quenalda Graphite Co., Birmingham, Ala., has started operations at its finishing plant at Lineville, Ala. The company owns two graphite mines near Lineville, with a daily capacity of about 300 tons each.

Clinchfield Sand and Feldspar Corp., Baltimore, Md., is arranging for construction of a feldspar crushing, grinding and pulverizing mill in the vicinity of Brookneal, Va. A portion of equipment will be secured from a plant at Charlotte, N. C., and additional acquired. The company will operate feldspar quarries at Moneta, Va., for raw material supply.

Personals

Rudolph P. Miller, consulting engineer, announces the removal of his offices to 101 Park Ave., New York City.

H. W. Hardinge, president of the Hardinge Company, York, Penn., recently returned from Europe with Mrs. Hardinge, where he made an extended business and pleasure trip.

James T. Knox, consulting engineer and proprietor of stone crushing plants and lime plants in Australia, is in the United States studying American rock products plants.

H. E. Miller, production engineer for the Gypsum, Ohio, plant of the United States Gypsum Co., is leaving for Oklahoma and later expects to locate in California, where he will represent his company.

William McCormick has resigned as Pittsburgh sales manager of the Niles Tool Works Co. and the Pratt & Whitney Co. and is now western sales representative of Leeds, Tozzer & Co., Inc., New York, N. Y.

A. D. Stancliff, Alabama Portland Cement Co., Birmingham, Ala., is now general superintendent of both the Louisiana Portland Cement Co. of New Orleans, La., and the Alabama Portland Cement Co.

R. P. Mayer, former district sales manager for the Pennsylvania-Dixie Cement Corp. at Cincinnati, has been made sales manager for the Pyramid Portland Cement Co., recently purchased by the eastern concern. Mr. Mayer is a graduate of Georgia Tech.

Carl F. Scott, manager of building equipment sales, General Electric Co., has entered the employ of the Gurney Elevator Co. in New York as assistant sales manager. Mr. Scott is a graduate of Haverford College and has been in the employ of the General Electric Co. since 1908.

Seymour H. Sutton, who recently joined the pump department of the American Manganese Steel Co., has had considerable experience which will enable him to assist sand and gravel operators toward solution of their pumping problems. Graduating from Cornell University in 1911 with a degree in M.E., he joined the engineering sales staff of the Gould Pump Co. After leaving Gould he spent eight years in the engineering department of the American Steel Foundries on construction and maintenance. He was then with the Peoples Gas Light and Coke Co., Chicago, for two years, promoting gas as against other fuels, and for two years manager of the Erie Pump and Engine Works, manufacturers of centrifugal sand and gravel dredging pumps, in charge of sales, engineering and advertising.

Obituaries

W. C. Earnshaw, assistant superintendent of the Carbon Limestone Co., died April 15, 1928, in his home at Hillsville, Penn. He was a brother of Frederick Earnshaw, president of the Carbon Limestone Co. Mr. Earnshaw was born in 1871 and had been associated in the limestone industry for several years.

A. L. Broomall, aged 44 years, manager of the renewal parts engineering department of the Westinghouse Electric and Mfg. Co., died April 10, 1928, in his home at East Pittsburgh, Penn., from pneumonia. Mr. Broomall was a graduate of Lehigh University. Immediately after graduation he entered the graduate students' course of the Westinghouse company and continued to work for the same company until his death.

William Robert Quinn, well-known designer of fuel oil burning equipment, died very suddenly of heart disease in his room at the Hotel Manger, New York, on April 12. Mr. Quinn had been a resident of San Francisco for several years past, having gone there as the Pacific coast representative of Combustion Engineering Corp. He was in New York on a business trip at the time of his death. Mr. Quinn was president of the Quinn Oil Burner and Torch Co. until this company was purchased by Combustion Engineering Corp. in 1922. He then became manager of the fuel oil burning equipment department of the latter organization, which position he held until he went to San Francisco as Pacific coast representative.

Manufacturers

Brown Instrument Co. announce the removal of their Pacific coast branch to 420 South San Pedro St., Los Angeles, Calif.

American Hoist and Derrick Co., St. Paul, Minn., recently appointed J. T. Seaver, Inc., Cleveland, Ohio, as its representative in the Cleveland district.

American Hoist and Derrick Co., St. Paul, Minn., announces the removal of its Pittsburgh office to 604 Chamber of Commerce Bldg., effective May 1.

American Steel Abrasives Co., Galion, Ohio, are adding a 40x80-ft. two-story wing to their present plant. It is reported this will nearly double their capacity.

Timken Roller Bearing Service and Sales Co. announce the appointment of W. H. Post as manager of the Pittsburgh, Penn., branch office of the company.

Trico Fuse Mfg. Co., Milwaukee, Wis., announces the removal of its Pittsburgh office to new and larger quarters at 405 Penn Ave., with Wm. A. Bittner in charge.

Consolidated Products Co., New York City, announce the removal of their quarters on the 14th floor, 15 Park Row building, to the 16th floor, where they will occupy an entire wing.

Earle C. Bacon, Inc., engineers of New York City, have opened a New England branch office at 129 Church St., New Haven, Conn., under the supervision of W. H. Milroy.

Wagner Electric Corp., St. Louis, Mo., announces the removal of their New York City branch sales office from 50 Church St. to Suite 1110, 30 Church St. The New York City service station remains at 321 W. 54th St.

Chain Belt Co., Milwaukee, Wis., announce that Howard J. Griffen, formerly sales manager for the Spencer Construction Co., Baltimore, Md., has joined their sales organization and will be connected with the chain and engineering division.

Valve Bag Co., Toledo, Ohio, has announced that Burton A. Ford, formerly secretary and general manager of the National Lime Association, is now associated with the company in the capacity of sales manager.

Monighan Machine Co., Chicago, Ill., has been recently reorganized as the Monighan Manufacturing Corp., Chicago, Ill., the latter company having taken over all the assets and assumed all the liabilities, of the former. Operations will proceed under the same management as before.

Webster Manufacturing Co., Chicago, Ill., is moving its Cincinnati office to the Chamber of Commerce Bldg. L. A. Scheck, who has been in charge of the Cincinnati office for some time, and was previously in charge of the company's Boston office, will continue his supervision of the office.

Columbus McKinnon Chain Co., Tonawanda, N. Y., has acquired control of the hoist division of the Chisholm-Moore Mfg. Co., Cleveland, Ohio. The general sales offices and factory will continue to operate in Cleveland undeh the same name as in the past.

Foote Bros. Gear & Machine Co., Chicago, Ill., announce the appointment of Kenneth Grant to its sales organization, to cover southern Wisconsin, northern Illinois, and eastern Iowa, with headquarters for the present at the company's offices in Chicago. Mr. Grant was formerly connected with the Machinists Supply Co. of Chicago.

General Refractories Co., Philadelphia, announce the appointment of W. G. Owen to assume charge of sales in the Philadelphia territory relieving L. Tschirky, who will devote his time to sales development of the company's specialty products. Mr. Owen was formerly sales manager of the Haws Refractories Co. of Johnstown, Penn.

Foote Bros. Gear and Machine Co., Chicago, Ill., announces the appointment of Bentley & Holmgren, Court Exchange Bldg., Bridgeport, Conn., as representatives in Connecticut and western Massachusetts. The Wideke Supply Co., Oklahoma City, Okla., has been appointed to represent the Foote company in Oklahoma and vicinity.

National Flue Cleaner Co., Groveville, N. J., manufacturers of soot blowers for fire tube boilers, has recently appointed as Chicago representative the Naylor-Hickey Corp., 643 Washington Blvd., Chicago, Ill., and as New England representative the Furnace Development Co., 511 Westminster St., Providence, R. I.

General Electric Co., Schenectady, N. Y., received orders for the first three months of the present year amounting to $79,925,840, compared with $77,550,581 for the corresponding quarter in 1927 (an increase of 3%) and with $86,433,658 for the first quarter of 1926, according to a recent announcement of President Gerard Swope.

Cleveland Electric Tramrail Division of the **Cleveland Crane and Engineering Co.**, Wickliffe, Ohio, announces the appointment of Leeds, Tozzer & Co., Inc., 75 West St., New York, N. Y., as representatives of its tramrail system in Manhattan, Bronx and Staten Island, New York.

Stephens-Adamson Mfg. Co. of Canada, Ltd., has opened branch sales engineering offices at Toronto and Montreal, following the establishment of its complete manufacturing plant at Belleville, Ontario. The Toronto office is located in the Bank of Hamilton Bldg., with A. F. White in charge. George H. Smith is in charge of the Montreal office located in the New Birks Bldg.

Hazard Wire Rope Co., Wilkes-Barre, Penn., has been licensed to manufacture "Tru-Lay" preformed wire rope by the American Cable Co., Inc., developers of the wire rope. The American Cable Co. has also licensed the following foreign producers to manufacture the wire rope: Dominion Wire Rope Co., Ltd., Montreal, Canada; Bruntons, Musselburgh, Scotland, and Felten & Guilleaume Carlswerk, Cologne, Germany.

Hyatt Roller Bearing Co., Newark, N. J., has appointed O. W. Young chief engineer, with his headquarters at Newark. Mr. Young, who was formerly located with the Western Division sales office of the company, has been with the Hyatt company since 1915, connected with both the sales and engineering work. Previous to 1915, he was engaged in consulting engineering work in the Northwest, covering automotive, tractor and industrial accounts.

Lincoln Electric Co., Cleveland, Ohio, announce the following appointments: H. A. Stamper placed in charge of consumer motor sales in the New York district; D. F. Titus, formerly with the Portland Cement Association, placed in charge of the welder service in the New York district; A. H. Kirkpatrick appointed as manager of welder service in the Cincinnati district, replacing D. W. Carver who has been transferred to the Cleveland district; H. E. Nelson is placed in charged of consumer motor sales in the Cincinnati district; P. A. Ludwig has assumed charge of welder service in Philadelphia and the vicinity; Forrest Kessler has been transferred from welder time service department to the welder service division in the Cleveland district; J. R. Rothermal is in charge of welder service at Chicago, and W. Weaver has been placed in charge of consumer motor sales in the same district.

Trade Literature

***NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention* ROCK PRODUCTS.**

Smiling Customers. Illustrated bulletin on "Multi-Wall" bags for cement and plaster. BATES VALVE BAG CORP., Chicago, Ill.

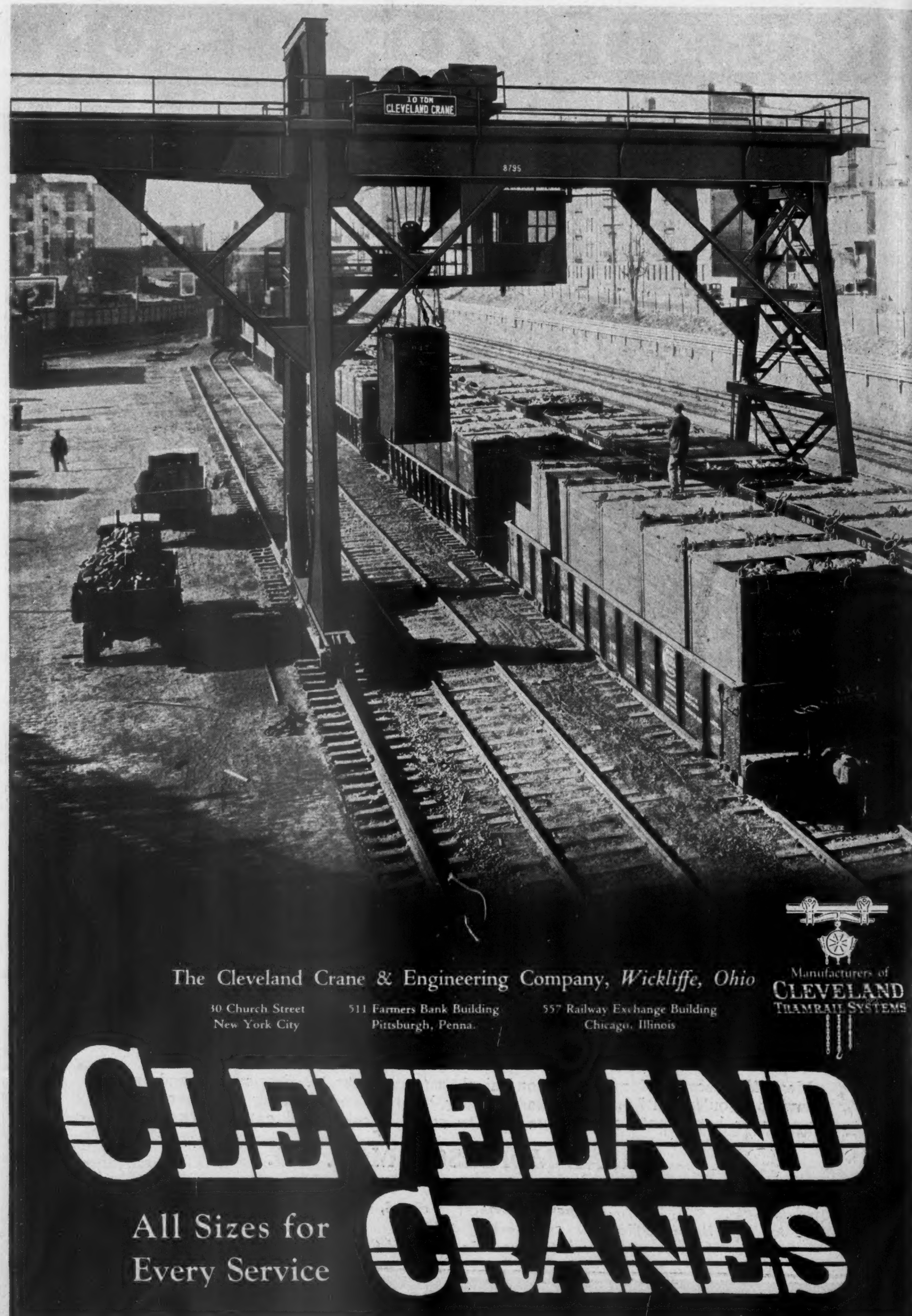
Pneumatic Tools and Accessories. Catalog No. 561 of various types of pneumatic tools and equipment, illustrated with cuts of practically all the listed equipment. CHICAGO PNEUMATIC TOOL CO., New York, N. Y.

General Electric Co. issues a new pamphlet, "Electric Apparatus for Use with the Cottrell Precipitation Process," describing the special forms of transformers, switchboards and rectifiers the company has developed for such use. Much of the book is devoted to the "Kenotron" vacuum tube rectifier.

Incor is a 12-page pamphlet giving many examples of the use of "Incor" cement, the rapid hardening cement made by the International Cement Corp. The most spectacular use was that of lining a part of the Moffat Tunnel in Colorado, a rapid hardening cement being necessary so that full strength could be attained before the movement of the ground distorted the tunnel.

Compressors and Vacuum Pumps. 40-page illustrated bulletin on Class ER and FR compressors and vacuum pumps, showing views of types and installations. **Condensed Catalog.** Short illustrated catalog of 1-R products, including portable compressors, rock drills hoists, breakers, and similar equipment. INGERSOLL-RAND CO., New York, N. Y.

G-E Bulletins. GEA-916. Electrical apparatus with the Cottrell precipitation process. **GEA-835A.** D. C. magnetic controller for constant and adjustable speed motors. **GEA-752.** Direct-current motors, type BO. **GEA-233B.** Single-stage, centrifugal air compressors. **GEA-308A.** Arc suppressor plates for drum controllers. **GEA-934.** Automatic throw-over panels. **GEA-950.** A. C. enclosed starting rheostats. **GEA-948.** D. C. magnetic controller. **GEA-894.** Adjustable speed direct current motors, type 60.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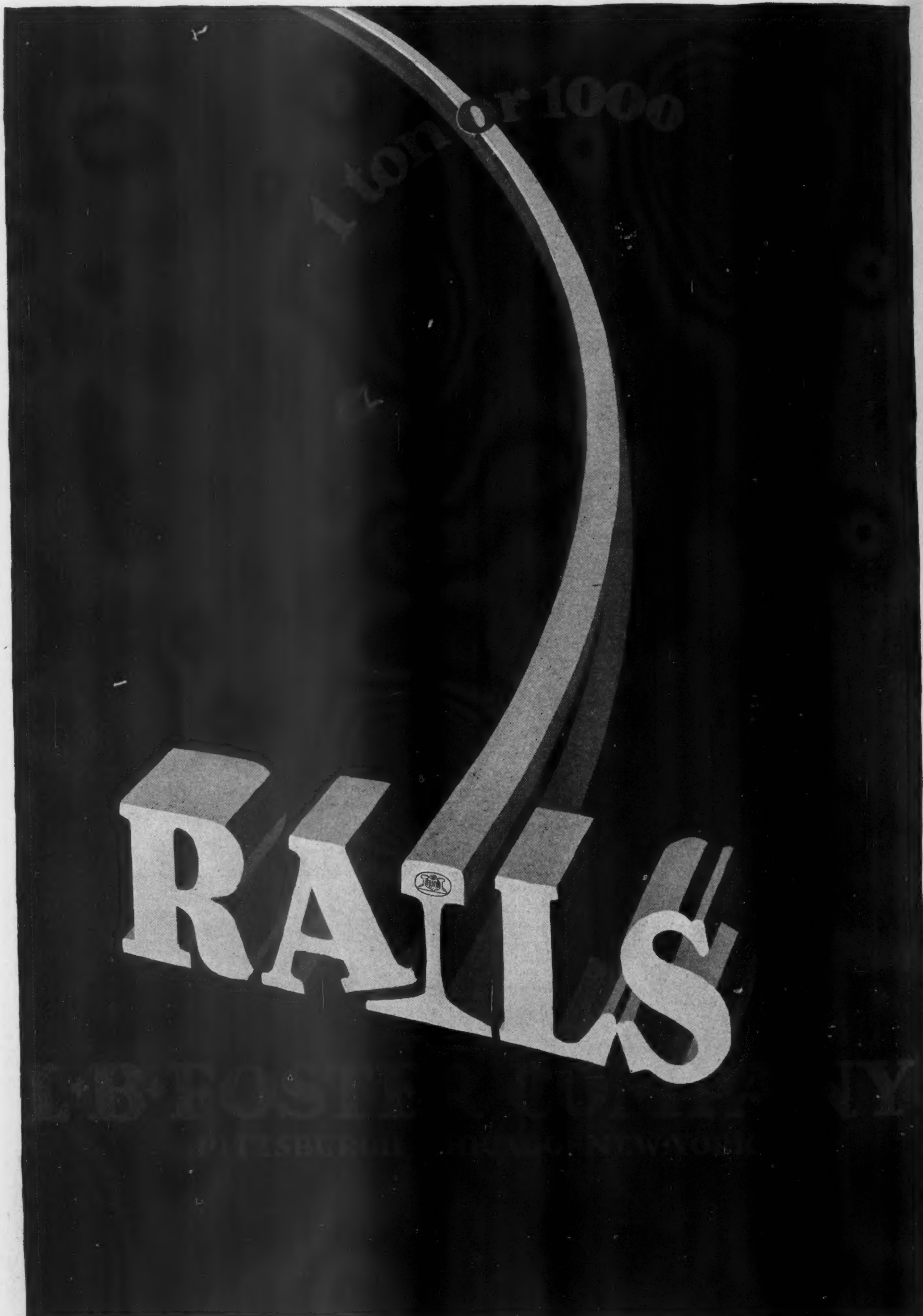
CLEVELAND CRANE
The Cleveland Crane & Engineering Company, *Wickliffe, Ohio*
30 Church Street
New York City
511 Farmers Bank Building
Pittsburgh, Penna.
557 Railway Exchange Building
Chicago, Illinois
Manufacturers of
CLEVELAND
TRAMRAIL SYSTEMS
CLEVELAND
CRANES
All Sizes for
Every Service


1 ton or 1000
RAILS

DOBBIE DERRICK

A range of performance never before obtained in derrick equipment is made possible by a new *full rotating* feature.

TO EQUIPMENT DISTRIBUTORS

Some Exclusive Sales Territories are now Available.

A Complete Stock of

Hand Winches
Sheaves
Blocks
Wood Derrick Fittings

are carried in stock at

74 WARREN STREET
NEW YORK CITY

A *full circle* swing! More *speed* and *efficiency!* Increased working area! What operator of derrick equipment isn't looking for these very things? The new Dobbie Full Rotating Derrick has these desirable qualities in full measure. It is a development that establishes an entirely new conception of what to expect in derrick performance.

The operating limitations that characterize derricks of the stiff-leg type are entirely overcome by this *full rotating* machine. Revolving on a single circular rail track, on roller bearing equipped wheels, it may be rotated *continuously* in one direction. No time lost in "back tracking" such as always occurs with a stiff-leg derrick with its limited swing.

This new derrick is unusually fast, too. Capable of making 2.4 revolutions per minute, it provides for every type of derrick operation a material saving in time. Furthermore, since one of these derricks is easily equal to two of the ordinary type, the operating cost of one machine is also saved.

Construction is of steel throughout and remarkably sturdy. Operated by a Mundy 3-speed Hoist, in either gasoline or electric power.

The Mundy Sales Corporation

Distributors for
The Dobbie Foundry & Machine Co., Niagara Falls, N. Y.
Sales and Export Office, - 30 Church Street, New York

DOBBIE DERRICKS

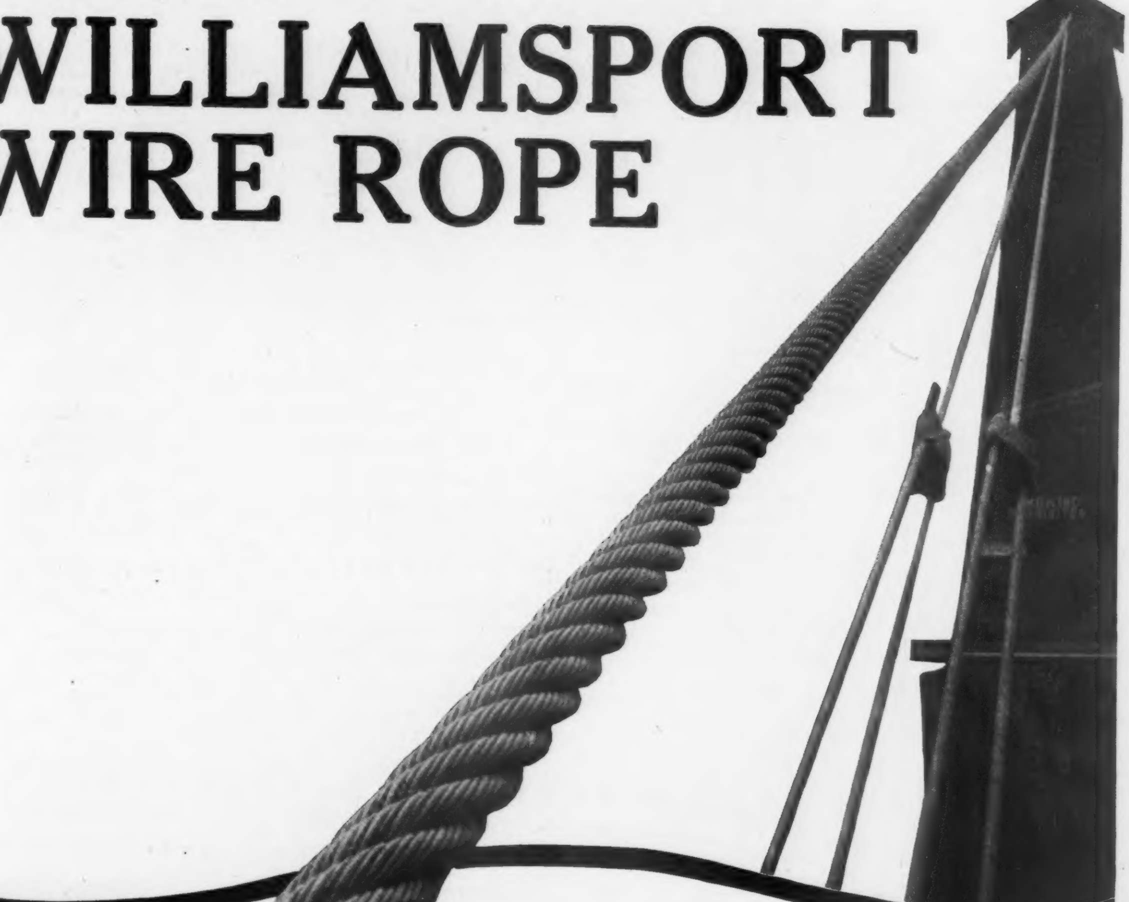
Sheaves ~~ Hand Winches ~~ Blocks

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 136

For Safety, use

WILLIAMSPORT WIRE ROPE



For Bridges, Tramways, Hauling Derricks, Shovels, Cranes, Hoists and uses for which extreme strength and certainty of grade is necessary.

WILLIAMSPORT

Telfax Tape Marked Factory Certified

WIRE ROPE

Will serve you better.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works:
WILLIAMSPORT, PA.

General Sales Offices:
122 So. Michigan Ave., CHICAGO

Use Madesco Tackle Blocks—They Stand the Gaff

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

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Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 136

Generators (Acetylene)
Haynes Stellite Co.
Linde Air Products Co.
Prest-O-Lite Co.
Prest-O-Weld Co.

Generators (See Motors and Generators)

Gloves (Asbestos)
Linde Air Products Co.
Prest-O-Weld Co.

Goggles
Linde Air Products Co.
Prest-O-Lite Co.
Prest-O-Weld Co.

Grab Bucket Cranes (See Cranes)

Grab Bucket (Hoists & Monorail) (See Cranes)

Grab Buckets—See Buckets (Grab, Clamshell, etc.)

Grapples (Stone)
G. H. Williams Co.

Grating (Steel)
Blaw-Knox Co.
Kerlow Steel Flooring Co.

Grinding Balls
Coates Steel Products Co.
Electro Metallurgical Sales Corp.

Grizzlies
Austin Mfg. Co.
Eagle Iron Works
Good Roads Machy. Co., Inc.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
Traylor Eng. & Mfg. Co.
Traylor Vibrator Co.

Grizzly Feeders
Traylor Vibrator Co.

Guard Rails
Koppel Industrial Car & Equipment Co.

Guns (Hydraulic)
Georgia Iron Works

Gypsum Plaster Plants
J. B. Ehrsam & Sons Mfg. Co.

Gyrating Screens (See Screens)

Hammer Drills
Chicago Pneumatic Tool Co.

Hammer Mills (See Crushers)

Hangers (Shaft)
T. B. Wood's Sons Co.

Haulage Systems (Electric)
Woodford Eng. Co.

Hoists
Chicago Pneumatic Tool Co.
Cleveland Crane & Eng. Co.
Dobbie Fdy. & Mach. Co.
S. Flory Mfg. Co.
Link-Belt Co.
Mead-Morrison Mfg. Co.
Mundy Sales Corp.
Northwest Engineering Co.
Sauerman Bros.
Smith Engineering Works
Street Bros. Mach. Works
Vulcan Iron Works.

Hose Couplings (See Couplings, Hose, Pipe)

Hose (Water, Steam, Pneumatic and Air Drill)
Chicago Pneumatic Tool Co.

Hose (Welding)
Linde Air Products Co.
Prest-O-Lite Co.
Prest-O-Weld Co.

Hydrators (Lime)
Arnold & Weigel.
Jackson & Church Co.
Kritzer Co.
McGann Mfg. Co., Inc.
H. Miscampbell

Hydraulic Guns (See Guns, Hydraulic)

Insulation (Electric)
General Electric Co.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
American Miag Corp.
Blaw-Knox Co.
Bonnot Co.
Hardinge Co.
McGann Mfg. Co., Inc.
Polysius Corp.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works.

Kilns (Shaft)
American Miag Corp.
Arnold & Weigel.
McGann Mfg. Co., Inc.
H. Miscampbell.
Vulcan Iron Works.

Kominuters (See Mills)

Laboratories (Magnetic)
Dings Magnetic Separator Co.

Laboratory Crushers
Sturtevant Mill Co.

Lead Burning Apparatus
Prest-O-Lite Co.
Prest-O-Weld Co.

Lights (Portable Acetylene)
Union Carbide Sales Co.

Lime Handling Equipment
Arnold & Weigel.
Fuller Company
Kritzer Co.
Link-Belt Co.
H. Miscampbell.
Raymond Bros. Impact Pulv. Co.

Lime and Hydrating Plants
Arnold & Weigel.
McGann Mfg. Co.
Vulcan Iron Works

Line Shaft Couplings
Huron Industries, Inc.
D. O. James Mfg. Co.
W. A. Jones Fdy. & Machine Co.

Linings (See Mill Liners & Linings)

Liquid Oxygen
Keith Dunham Co.

Loaders and Unloaders
Bucyrus-Erie Co.
Good Roads Machy. Co., Inc.
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
G. H. Williams Co.

Locomotive Cranes (See Cranes)

Locomotives (Steam, Gas and Electric)
Fate-Root-Heath Co. (Gas).
General Electric Co.
Lima Locomotive Works (Steam).
Plymouth Locomotive Works (Gas).
Vulcan Iron Works
Geo. D. Whitcomb Co.

Locomotives (Storage Battery)
General Electric Co.
Geo. D. Whitcomb Co.

Machinery Guards
Harrington & King Perforating Co.

Magnetic Pulleys
Dings Magnetic Separator Co.

Magnetos
Eisemann Magneto Corp.

Magnets
General Electric Co.
Dings Magnetic Separator Co.

Manganese Steel
Electro Metallurgical Sales Corp.

Manganese Steel (Plate and Sheets)
Electro Metallurgical Sales Corp.

Manganese Steel Castings
Alloy Steel & Metals Co.
American Manganese Steel Co.
Electro Metallurgical Sales Corp.

Manifolds (Oxygen)
Prest-O-Lite Co.

Metals (Alloys, See Alloys, Babbitt Metal, Manganese Steel, Steel, etc.)

Mills, Grinding (Ball, Tube, etc.) (See also Crushers, Hammer)
Allis-Chalmers Mfg. Co.
American Miag Corp.
Bonnot Co.
Electro Metallurgical Sales Corp.
Hardinge Co.
Jackson & Church Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
American Manganese Steel Co.
F. L. Smidth & Co.

Mining Engineers (See Engineers)

Mixers, Concrete
Transit Mixer Co.

Monorail Systems
Cleveland Crane & Eng. Co.

Motors and Generators (Electric)
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.

Nitrogen
Linde Air Products Co.

Nuggets (Tubemill, Grinding)
Coates Steel Products Co.

Oil Burners
Chicago Pneumatic Tool Co.

Oil Burning Equipment
Electro Metallurgical Sales Corp.
Raymond Bros. Impact Pulv. Co.

Oilers
Traylor Vibrator Co.

Ore Jigs
McLanahan-Stone Machine Co.

Oxy-Acetylene Apparatus
Haynes Stellite Co.
Linde Air Products Co.
Prest-O-Lite Co.
Prest-O-Weld Co.

Oxygen Gas
Linde Air Products Co.

Oxygen (Liquid) See Liquid Oxygen

Perforated Metal
Cross Engineering Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
Morrow Mfg. Co.
W. Toepfer & Sons Co.

Pile Drivers
Bucyrus-Erie Co.

Pipe
L. B. Foster Co.

Pipe Flanges
Georgia Iron Works

Plates (Steel)
Blaw-Knox Co.

Plug Valves (See Valves)

Pneumatic Drills (See Drills)

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
Austin Mfg. Co.
Fuller Company
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Powder (Blasting)
Hercules Powder Co.

Power Units
Fairbanks, Morse & Co.

Protectors (Crushers)
Dings Magnetic Separator Co.

Pulleys
Huron Industries, Inc.

Pulleys (Friction Clutch)
W. A. Jones Fdy. & Machine Co.
T. B. Wood's Sons Co.

Pulleys (Magnetic) (See Magnetic Pulleys)

Pulverizers (See also Crushers, Mills, etc.)
Allis-Chalmers Mfg. Co.
American Miag Corp.
Bonnot Co.
Hardinge Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulverizer Co.

Pumps (Air Lift)
Chicago Pneumatic Tool Co.
Fuller Co.
Pennsylvania Pump & Comp. Co.

Pumps (Cement Slurry)
American Manganese Steel Co.
Electro Metallurgical Sales Corp.
Fuller Co.
Polysius Corp.
F. L. Smidth & Co.
A. R. Wilfley & Sons.

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
De Laval Steam Turbine Co.
Fairbanks, Morse & Co.
Pennsylvania Pump & Comp. Co.
A. R. Wilfley & Sons.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Georgia Iron Works
Traylor Vibrator Co.
A. R. Wilfley & Sons.

A Novel Agitator

Cement Slurry Storage Basin with Traveling Agitator installed at the plant of Glens Falls Portland Cement Company, Glens Falls, New York

THE concrete basin is 125 feet long, 25 feet wide and 21 feet deep and has a storage capacity of finished slurry sufficient for approximately 7350 barrels of portland cement.

The agitation is accomplished by revolving stirring arms suspended from a platform which travels automatically back and forth along the basin. Air is also injected into the mix through nozzles on the stirring arms.

All operating and control machinery is mounted on the traveling platform. Two motors are required, a 10-horsepower for the agitators and a 5-horsepower for the travel.

The advantages of this agitator over the usual design for same capacity are lower first cost, saving of considerable power (about 50 to 60 horsepower), reduction in upkeep and repair costs.

F. L. Smidth & Co.

(Incorporated 1895)

ENGINEERS

Designers and Equippers of Cement Making Factories

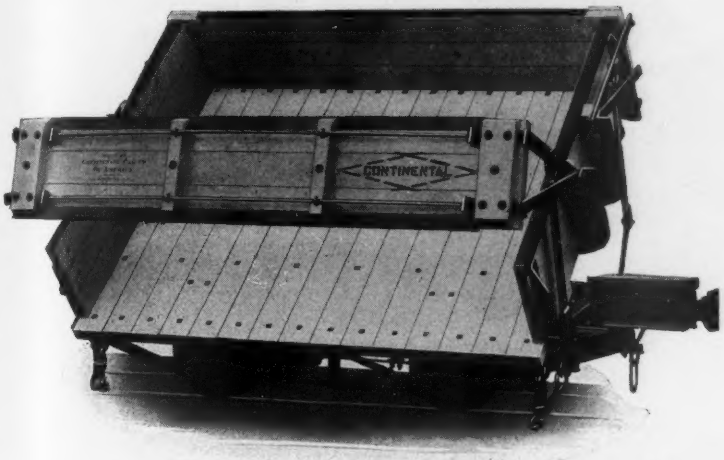
50 Church Street **NEW YORK**

Factory, Foundry and Laboratory—Elizabeth, N. J.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 136

Built Close to the Rails –yet with a Steep Dumping Angle



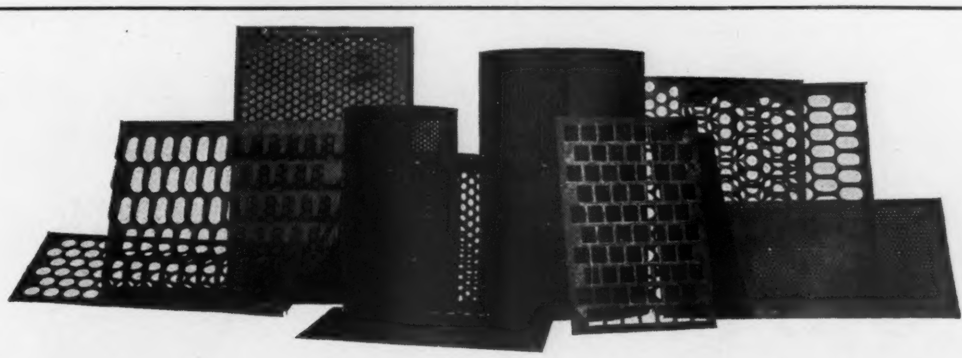
CONTINENTAL CARS are built as low over all as it is possible to build them—and at the same time maintain a steep dumping angle.

The Continental Heavy Duty 5-Yard Dump Car (illustrated), is a car particularly well suited for heavy steam shovel work, and where it is desired to use a single truck, narrow gauge car of more than four yards capacity. The bed dumps at an angle of approximately 45 degrees, permitting quick discharge of the load. This steep angle—combined with the automatic door arm for dumping—allows the material to flow easily out of the bed, and throws it away from the track.

Write for our catalog showing types of CONTINENTAL CARS for all purposes

KENTUCKY WAGON MFG. CO. INC.

LOUISVILLE, KY.



For Best Results Use the Morrow!

THE Morrow Perforated Metal Screens for sizing and preparing sand, gravel, stone, and other bulk materials are made by a company specializing in screening machinery.

Behind our recommendations to you lies years of experience which has taught us the best line of screens to use for a given work.

You are offered such sizes and shapes of perforations which we know to be best suited to the screening of bulk materials.

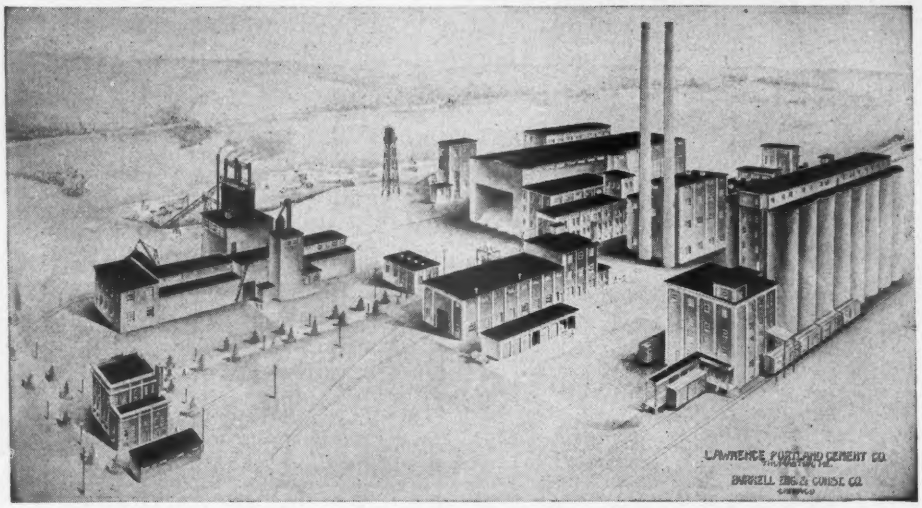
If our wide stock does not suit your particular purpose, we will make special plates to your specifications. Our factory is equipped to roll or flange plates to order, and will punch marginal holes as directed.

Write for Bulletin No. 55

THE MORROW MFG. CO. — QUALITY MORROW SERVICE — WELLSTON - OHIO

BURRELL ENGINEERING and CONSTRUCTION COMPANY

513 JACKSON BLVD., CHICAGO



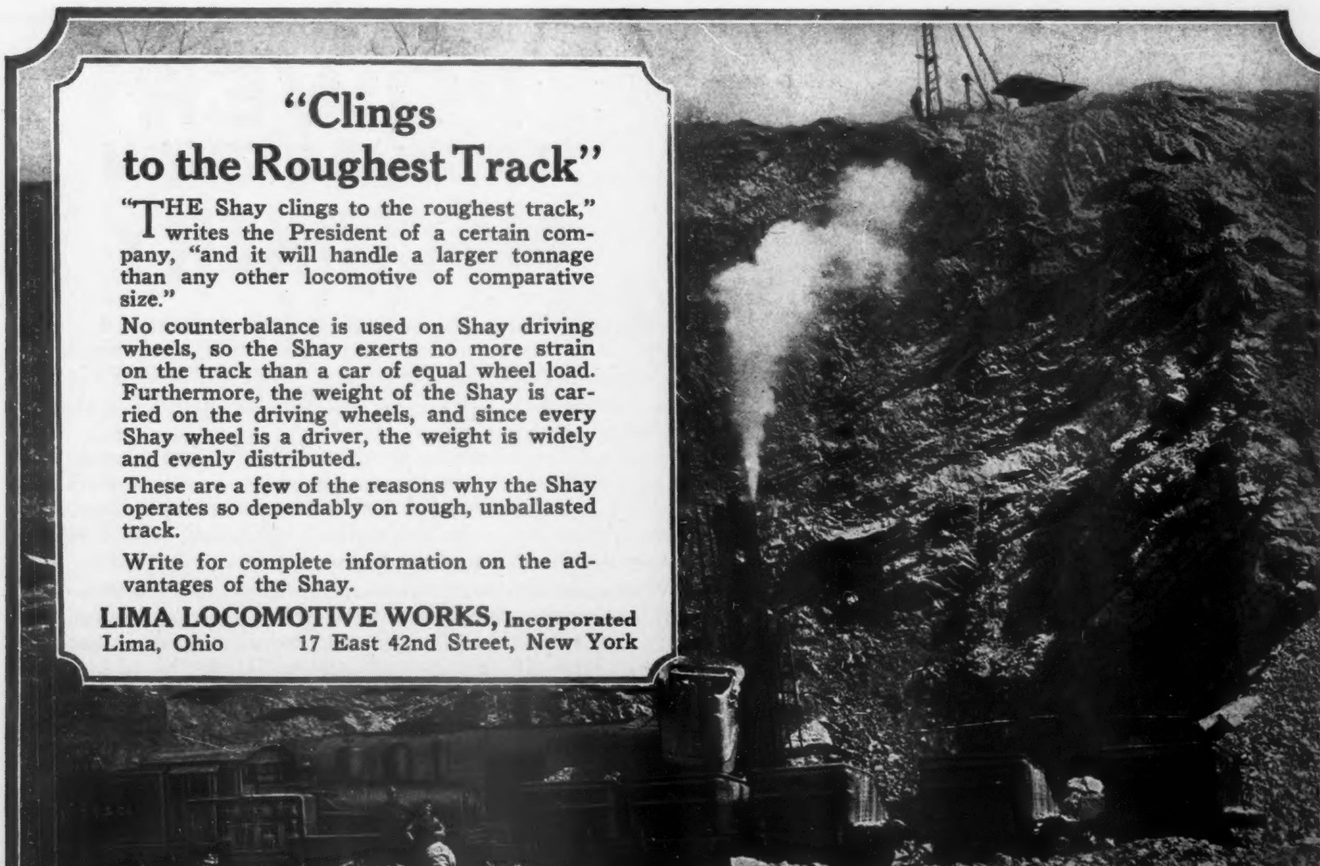
Designers and Builders of

**Cement Plants,
Stone Crushing
Plants,
Lime and Gypsum
Plants, and
Associated Buildings**

Our artist's conception of the plant under construction for Lawrence Portland Cement Company, Thomaston, Maine, noteworthy because plant is practically concrete throughout

A PARTIAL LIST OF OUR CLIENTS

Albert Mfg. Co.
Atlantic Gypsum Co.
Blue Mountain Stone Co.
Colorado Portland Cement Co.
Coplay Cement Mfg. Co.
Great Lakes Portland Cement Co.
Hoosac Valley Lime Co.
Huron Portland Cement Co.
Indiana Portland Cement Co.
International Cement Co.
Lawrence Portland Cement Co.
Lehigh Portland Cement Co.
Louisville Portland Cement Co.
Louisiana Portland Cement Co.
Michigan Alkali Co.
Nazareth Cement Co.
New York Trap Rock Co.
Newaygo Portland Cement Co.
Petoskey Portland Cement Co.
Sandusky Cement Co.
Southern Cement Co.
Tomkins Cove Stone Co.
United States Portland Cement Co.
United States Gypsum Co.
Utica Hydraulic Cement Co.
Volunteer Portland Cement Co.
Wellston Iron Furnace Co.



"Clings to the Roughest Track"

"THE Shay clings to the roughest track," writes the President of a certain company, "and it will handle a larger tonnage than any other locomotive of comparative size."

No counterbalance is used on Shay driving wheels, so the Shay exerts no more strain on the track than a car of equal wheel load. Furthermore, the weight of the Shay is carried on the driving wheels, and since every Shay wheel is a driver, the weight is widely and evenly distributed.

These are a few of the reasons why the Shay operates so dependably on rough, unballasted track.

Write for complete information on the advantages of the Shay.

LIMA LOCOMOTIVE WORKS, Incorporated
Lima, Ohio 17 East 42nd Street, New York

NORBLO

NB NOR BLO A COMPLETE SERVICE

Dust Collecting Equipment—

NORBLO Dust-Collectors and Incoming Pipe Lines; in the Valley Forge Portland Cement Company.

CEMENT, Lime, Gypsum or Stone Plants—in fact any plant where there is a dust problem to contend with—may have COMPLETE DUSTLESSNESS by the installation of NORBLO.

And in the modern plant, efficient equipment for dust control and recovery is considered essential. Almost as essential in fact as the producing equipment itself—for upon the effectiveness with which the plant is kept free from dust depends to a great degree the length of life and operating economy of the machinery and equipment actually responsible for plant output.

The presence of NORBLO Dust-Collecting Equipment in your plant will have several effects. One of the most important will be the prevention of the devastating effects of free dust on plant equipment. With NORBLO Equipment you SAVE MACHINERY and incidentally—SAVE THE DUST.

The Norblo Guarantee—

We will give you complete satisfaction, and we positively guarantee NORBLO Equipment to conform to the requirements of your State Sanitary Laws and to be unsurpassed in construction and operation for the class of work for which it is intended.

NORTHERN BLOWER CO.

West 65th St. and Denison, Cleveland

A DRAG SHOVEL

by PAGE

Standard of the world PAGE

BUILT for any excavating machine—no changes necessary for installation.

Two-drum operation—one to load the bucket—the other to hoist the boom.

Tremendous digging ability because of the weight of boom on bucket.

Cutting action exactly like a dragline bucket for full length of stroke.

Ability to pick up bucket as soon as loaded.

Reach—approximately same as standard dragline boom.

Ability to load accurately in field hopper or direct into cars.

Perfect control of the bucket at any point.

Bucket returns to pit teeth first.

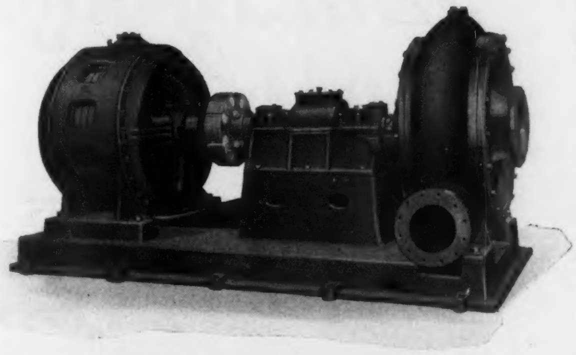
Full load line speed—single part line.

These are the features that recommend the Page Drag Shovel to your use. Sold on positive guarantee to increase yardage. Write for details.

PAGE ENGINEERING CO.

844 Rush St. Chicago, Ill.

HEAVY DUTY SAND PUMPS



10-in. Left Hand Bottom Discharge Heavy Duty Sand Pump directly connected to 300 H.P., 600 R.P.M. Allis-Chalmers Type ANY Motor

THE accompanying cut shows one of our Heavy Duty units. These pumps are very rugged and are substantially built throughout. The bearings, both radial and thrust, are of such design and construction that the unit is capable of meeting extreme conditions of severe service.

Our line now embraces these pumps in sizes 6-in., 8-in., 10-in., 12-in., 14-in., and 15-in., can be supplied for directly connected motor drive, or for chain or belt drive. All units can be furnished in either right or left hand, and position of discharge top or bottom.

Prices and descriptive sheets sent on request

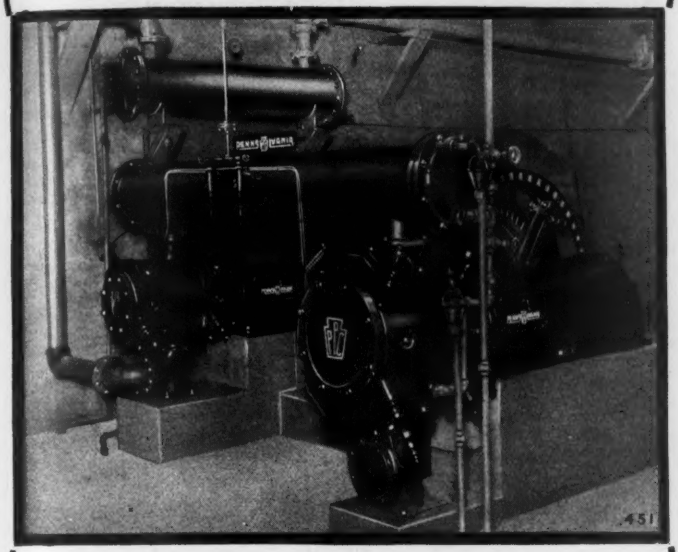
GEORGIA IRON WORKS

AUGUSTA, GEORGIA

Established 1891

PENNSYLVANIA

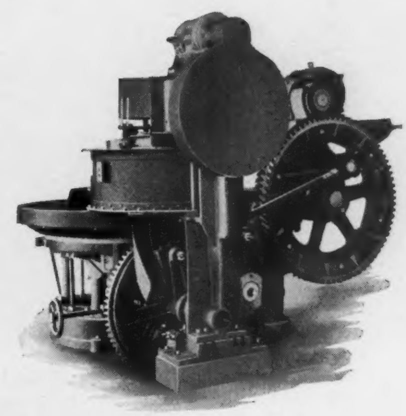
WHERE power plant requirements are most exacting, the design and construction of the PENNSYLVANIA Duplex Cross Compound Two-Stage, Direct Synchronous Motor Connected Air Compressors enable them to measure up to the highest standards.



"None Better Built"

Pennsylvania Pump and Compressor Co.
Main Office and Works: Easton, Pa.
Sales Representatives in Principal Cities

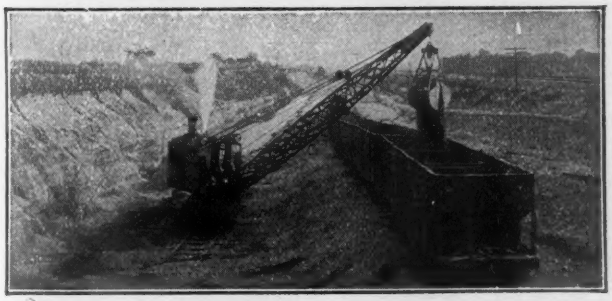
THE SAGINAW ROTARY PRESS



Moulds are uniformly filled with material from deep agitator, and Sand-Lime Bricks of uniform density are regularly produced.

JACKSON & CHURCH Company
SAND LIME BRICK MACHINERY — SAGINAW, MICH. U. S. A.

OHIO LOCOMOTIVE CRANE



Steam—Gas—Electric

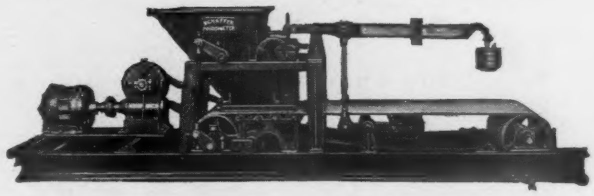
Hook, Clamshell, Dragline
Magnet or Pile Driver Service

10 to 50 Ton Capacities

The Crane with the 10 Year Guarantee
Catalog on Request

THE OHIO LOCOMOTIVE CRANE CO.
High Street, Bucyrus, Ohio

SCHAFFER POIDOMETER



ALMOST HUMAN

Schaffer Poidometers are the mechanical brains of the plant. They are more than that—they are guardians of the quality standards you have set for your product—they prevent waste and assure accuracy and maximum economy.

If you are handling a variety of materials, arrange your Poidometers in batteries—set one for each material and for the proportion wanted—then forget it! The Poidometer will do your bidding better than your most loyal employee. If any machine is not getting its full quota of material, the entire battery will automatically stop. Space does not permit of a thorough explanation of the many cost-saving qualities of Schaffer Poidometers.

WRITE FOR FULL DETAILS

SCHAFFER POIDOMETER CO.
2828 Smallman, Pittsburgh, Pa.

Paramount Brick Works, Inc.

BROOKLYN, NEW YORK

Largest and most modern Sand-lime Brick Plant. Present Production by KOMNICK PROCESS, 10,000 Superior Quality Brick per hour. Popular demand for product required its immediate expansion from four to six units. Ask for official test of brick.

IN no small part, the efficiency of any brick plant depends upon the dependability of the producing equipment. This fact was recognized by the Paramount Brick Works, Inc., Brooklyn, N. Y., part of which plant appears above. Perhaps that accounts for it being equipped with KOMNICK machinery. Economical operation is thus made a certainty.

KOMNICK MACHINERY COMPANY, Inc.
Lafayette Building, Detroit, Michigan

ENGINEERS

A Specialist in Cement Plants

IF you are interested in building a cement plant, making additions, financing or reorganizing, the Ferguson organization can render invaluable assistance.

First hand investigations and reports on raw materials for Portland Cement. General estimates and suggestions for arrangement of complete plants or any part. Constructive ideas for financing complete new plants or reorganization. Money-saving plans for use of standardized methods in construction and equipment.

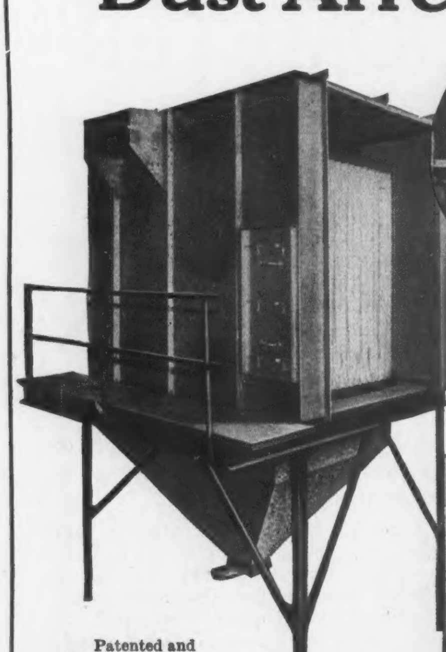
And · · · recommendations based on a survey of your plant that will point out important economies in production.

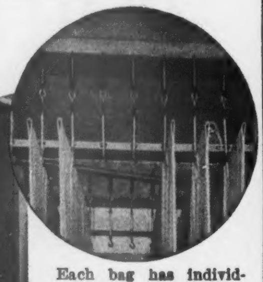
Write, wire or phone for a Ferguson executive

THE H. K. FERGUSON COMPANY
Hanna Building · · · Cleveland, Ohio
Phone: SUperior 3620
New York · Detroit · Birmingham · Tokio, Japan

Ferguson
ENGINEERS

New Type Dust Arrestor





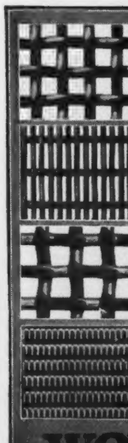
Each bag has individual spring suspension. Shaking is done horizontally, like snapping a rug, flexing material and getting all dust out of cloth.
In ten minutes a bag can be replaced and operation resumed.

Patented and Patents Applied for

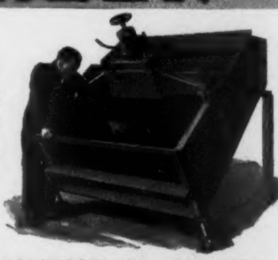
"Quality Equipment Pays in the End"

THE NEW HAVEN SAND BLAST CO.
New Haven, Conn. Cleveland, Ohio

HUM-MER *Electric* SCREEN



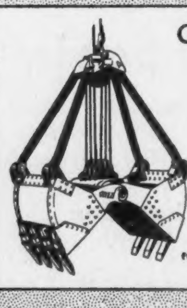
Screens from coarsest to the finest materials- either wet or dry
Catalogue sent upon request



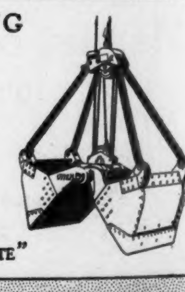
The W. S. TYLER COMPANY- Cleveland Ohio.

WOVEN WIRE SCREEN

Owen Buckets



GREATER DIGGING POWER
FASTER OPERATION
LONGER LIFE
GUARANTEED AGAINST BREAKAGE
and
"A MOUTHFUL AT EVERY BITE"



THE OWEN BUCKET CO.
6021 BREAKWATER AVENUE CLEVELAND, OHIO

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED—POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT

MACHINERY FOR SALE

JAW CRUSHERS—2½x4; 4x12; 8x10; 9x15; 10x20: 12x24; 13x30; 24x36; 30x42; 60x84.

GYRATORY CRUSHERS—All sizes, various makes.

CRUSHING ROLLS—8x5; 20x14; 21x11; 24x10: 24x14; 30x16; 36x16; 42x16.

DRYERS AND KILNS—Single shell—3½x16; 4x20; 4x30; 4'9"x36; 5x25; 5x50; 5½x40; 6x40: 7x70; 7x100; 8x80; 9x124; Double shell—3x16; 4x20; 5x30; 6x40; 8x85.

TUBE MILLS—3'x12", 4x16; 5x20; 5x22; 5'6" x16: 5'6"x20.

HARDINGE MILLS—3'x8"; 4½x16; 5x22; 6x22: 8x30: 8x36; 8x48.

PULVERIZERS—2-, 3-, 4-, 5-roll, high and low side Raymond Mills, also Beater types; 33" to 42" Fuller Lehigh Mills, Griffin Mills.

SWING HAMMER MILLS—All sizes—Williams, Jeffrey, Gruendler, Pennsylvania.

Send us your inquiries
Send us a list of your surplus equipment

Consolidated Products Company, Inc.
15-16-17 Park Row N. Y. C. Barclay 0603
Shops and Yards at Newark, N. J., cover 5 acres

Crawler Shovels

1—OSGOOD HEAVY DUTY (1-yd.), GASOLINE Caterpillar, new 1927, 1-yd. dipper; HIGH LIFT; also 40-ft. crane boom if desired, like new.

1—ERIE B-2 DREADNAUGHT, Steam Caterpillar, new 1927, 1-yd. dipper; HIGH LIFT, overhauled, perfect condition.

Cranes

1—NORTHWEST, Model 105, GASOLINE Caterpillar Crane, new 1926, 40-ft. boom, bucket operating, overhauled, excellent condition.

1—15-ton, LINK-BELT, K-2, GASOLINE Caterpillar Crane, new 1926, 50-ft. boom, bucket operating, overhauled.

Grey Steel Products Company
111 Broadway New York, N. Y.

GASOLINE CRANE BARGAIN

O & S—40-ft. boom, including ¾-yd. Bucket. Used 5 months only, wheel traction, Guaranteed mechanical condition. Cost new over $8000.00—**Priced at $3300 cash.**

HUNTER MACHINERY CO.
Milwaukee, Wisconsin

REBUILT LOCOMOTIVES

72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Three duplicates.
54-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam; built 1913.
50-ton Baldwin 6-wheel switcher, separate tender; built 1907.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam; built 1917.
35-ton Baldwin 4-wheel switcher, separate tender, 180 lb. steam; built 1921.
42-ton American 4-wheel saddle tank, 180 lb. steam; built 1910; Ohio boiler.
31-ton Baldwin 4-wheel saddle tank, 160 lb. steam; built 1914.
21-ton Porter 4-wheel saddle tank; built 1912. 36" gauge.
18-ton Porter 4-wheel saddle tank, built 1910-11, 36" gauge. 3 duplicates.

REBUILT DUMP CARS

20-yard all steel Western air dump, vertical cylinders. Ten of these.
12-yard steel underframe hand dumps. Seven of these.
6-yard steel underframe hand dumps. Eight of these.

REBUILT LOCOMOTIVE CRANES

22½-ton Ohio 8-wheel 2-line; built 1915.
20-ton Link-Belt 8-wheel, 2-line; built 1916.
15-ton Ohio 8-wheel, 2-line; built 1919.

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY
Birmingham Alabama

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

MUST BE SOLD AT ONCE

REAL BARGAINS

Located at Benson Mines, St. Lawrence County, N. Y.

Below is a brief inventory of the plant. If you do not see what you want, write us and full inventory will be mailed you.

2—No. 70 BUCYRUS STEAM SHOVELS.
1—5'x6' EDISON GIANT CRUSHING ROLLS.
2—36"x36" GIANT CRUSHING ROLLS.
1—18"x30" GIANT SMOOTH ROLLS.
1—18"x24" SPIKE CRUSHING ROLLS.
2—8'x6' KENNEDY BALL MILLS.
2—33-ton Standard Gauge SADDLE TANK LOCOMOTIVES.

2—304 hp. B. & W. RUST BOILERS.
36—SKIPS, 7½ yd. all steel with
20—Skip CARS, Standard Gauge.
2—10 ft. MORGAN Mechanical GAS PRODUCERS.

4—DEWATERING MACHINES.
WROUGHT IRON AND CAST IRON PIPE.
2—NEWAYGO SCREENS, Class E, No. 3.
4—CYCLONE DRILLS (Core).
1—CARWELL 36-in. Track Gauge BELT CONVEYOR TRIPPER.

1—ELEVATOR, 75' centers. Elevator complete with tail pulley and take-up bearings with 150 "V" shape 9x12x16 steel buckets with reinforced edges, with 17" stitched canvas 6-ply belt.

2—ELEVATORS, 26" width, 60' centers, 6-ply rubber belt, with 160 6x7x12 inch malleable buckets.

1—ELEVATOR, 25' centers. 22" 6-ply rubber belt, with 55 10x12x21" reinforced edge steel buckets.

325—9x12x12" "V" shape ELEVATOR BUCKETS.

7—42"x48" TRUMMER SCREENS.
1—22"x60" CORLISS ENGINE.
A LOT OF NEW SPUR GEARS AND SPROCKETS.

1—DAVIS STEAM POWER 3½" CORE DRILL.
1—¾-yd. ORANGE PEEL BUCKET.
1—⅝-yd. ORANGE PEEL BUCKET.
7000—2½x4½x9" FIRE BRICK; new.
2000—KILN LINING BRICKS, 3¼x6x9"; new.
200 tons 60-lb. RE-LAYER RAILS with 10 sets Frogs and Switches.

QUANTITY OF SMALLER RAILS.
4—4-yd. WESTERN WHEELED DUMP CARS.
1—No. 80 STURTEVANT EXHAUST FAN.
1—No. 55 STURTEVANT EXHAUST FAN.
1—No. 36 STURTEVANT EXHAUST FAN.
1—PIPE THREADING MACHINE, 2" to 6".
1—BLACKSMITH FURNACE AND BLOWER.
1—FRANKLIN PORTABLE CRANE HOIST.
1—No. 13 NIAGARA SHEAR. Will cut iron up to ⅜".

Steel Buildings

1—45' wide, 136' long by 75' high (4 floors).
1—76' wide, 143' long, 36' high.
1—34½' wide, 47' long, 75' high.
1—40' wide, 126' long, 30' high.
1—40' wide, 40' long, 50' high.

1—"U" Shape ALL STEEL STORAGE BIN, capacity about 200 tons of coal.
3 ph., 60 cycle, 440 volts, MOTORS, varying from 25 hp. to 200 hp.
3—300 KVA TRANSFORMERS.
1—100 kw. GENERAL ELECTRIC STEAM TURBO GENERATOR SET.
1—Single Drum STEAM HOIST, cylinder 8x12", drum 12x18".

1—VULCAN, Single Drum, double cylinder STEAM HOIST, cylinders 4x8", drum 6x15".

At Other Points

8'x125' ROTARY KILNS.
9'x100' ROTARY KILNS.
7'x120' ROTARY KILNS.
7'x100' ROTARY KILNS.
7½'x80' ROTARY KILNS.
7'-5½'x60' ROTARY KILNS.
5½'x36' ROTARY DRYERS.
5½'x60' ROTARY DRYERS.
8'x80' ROTARY DRYERS.
8'-8"x85' ROTARY DRYERS.
1—5'x33' ROTARY VACUUM DRYER.
No. 7½ KENNEDY GYRATORY CRUSHER.
No. 9-K ALLIS-CHALMERS GYRATORY CRUSHER.

No. 6 McCully GYRATORY CRUSHER.
No. 6 KENNEDY GYRATORY CRUSHER.

Also a Large Stock of Other Crushers

THE EQUIPMENT SALES COMPANY

Richmond, Va. **R. W. Storrs, Jr., Manager** **Address reply to Benson Mines, N. Y.**

MACHINERY FOR SALE

SPECIAL

One No. 6 Williams Universal Pulverizer.
One new 8'x125' Kiln.

ROTARY CRUSHERS

Three No. 00, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, One No. 0, One No. 1 Sturtevant Ring Roll Mills.

GYRATORY CRUSHERS

All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS

One 4"x8", Two 7"x10", Two 9"x15", One 6"x20", One 10"x15", One 10"x20", Two 12"x24", One 13"x30", One 15"x36", One 18"x36", One 24"x36", One 22"x50", One 36"x48", One 40"x42", One 60"x84".

CRUSHING ROLLS

One 8"x6", Two 14"x20", Two 16"x10", One 24"x12", Three 30"x10", Two 36"x16", Two 42"x16, and One 54"x24" Crushing Rolls.

DRYERS

One 3'x20', Three 4'x30', One 5'x40', Two 5½'x40', One 6'x60', One 7'x60', and Two 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30' Ruggles Coles type "A" and One 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6'x25' Louisville Dryers.

KILNS

One 4'x40', Two 6'x60', Two 6'x90', One 6'x100', One 6'x120', One 7½'x80', Three 8'x125'.

HARDINGE MILLS

One 4½', Two 6' and Two 8' Hardinge Mills.

SWING HAMMER AND TUBE MILLS

Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

THE HEINEKEN ENGINEERING CORP.
117 Liberty St. **New York City**

Telephone Cortlandt 5130

Special Bargains in Used Machinery

1—Gates Gyratory Crusher, No. 6, Style D.
1—Wet Chaser Mill, 8 ft. Double Discharge.
1—Wet Chaser Mill, 6 ft. Single Discharge.
1—Ruggles-Cole Dryer, 60 in. x 24 ft.
1—Ingersoll-Rand Steam Driven Air Compressor, 14 x 14½ x 18.
1—Curtis Air Compressor, Belt Driven (about 60 cu. ft. per M.).
1—Steam Engine, L. H. Drive, 75 H.P.
1—Steam Engine, 16x21.
1—Electric Triplex High Pressure Pump, 200 gal. per minute.
1—General Electric Generator, 170 H.P., 2300 v.
1—Jeffrey Radial Wagon Loader, Electric Traction.
1—Miscellaneous Assortment Shafting, 2-11/16 in. to 3-11/16 in.
1—Miscellaneous Assortment of Pulleys.

DECKERS CREEK SAND COMPANY
P. O. Box 186 **Morgantown, W. Va.**

FOR SALE

4½x12' Allis-Chalmers Tube Mill with new manganese lining.
3-, 4- and 5-roll Raymond Mills.
Infant, No. 2 and No. 6 Williams Mills.
33" and 42" Fuller-Lehigh Mills.
30" and 13" Farrell Jaw Crusher.
80"x45' and 8'8"x85' Ruggles-Coles Dryers.
4½x52½' Rotary Dryer or Calciner.
8'x80' Rotary Dryer, single shell.
42"x40' Rotary Kiln, cement lined.
Style A-2 and B-1 Broughton Mixers.

ROBERT P. KEHOE MACHINERY CO.
7 East 42nd St. **New York, N. Y.**

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4 STEAM SHOVELS

Will Sell Cheap, Account Not Adapted for Our Present Operations. All Mounted on Trucks

1—Marion, 2½-yd. Dipper, 45-ft. boom, 26-ft. Dipper Stick, 2 Boilers, no Light Plant.

1—Marion, 5-yd. Dipper, 90-ft. boom, 56-ft. Dipper Stick, 2 Boilers, Light Plant.

1—Marion, 6-yd. Dipper, 80-ft. boom, 56-ft. Dipper Stick, 2 Boilers, no Light Plant.

1—Marion, 3½-yd. Dipper, 75-ft. boom, 45-ft. Dipper Stick, 2 Boilers, Light Plant.

SUNLIGHT COAL COMPANY
310 S. Michigan Ave. **Chicago, Ill.**

New—Standard Make

1½ cu. yd. Steam and Electric

SHOVELS

At Greatly Reduced Prices

A two motor electric shovel equipped with 50 hp. hoist and swing motor, and 20 hp. crowd motor. High lift—heavy duty—factory guaranteed.

Also a new heavy duty, high lift steam shovel. Can be equipped with boom up to 32 feet in length.

Either machine recommended for severe operation requiring large output.

Terms to Meet Your Convenience

CHAS. F. COHEN
132-5 Cornell Ave. **Elyria, Ohio**

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2919

COMBINATION SHOVEL CRANE BARGAIN

¾-yd. full caterpillar Thew, in good operating condition, steam power—**$3900.00 cash.**

HUNTER MACHINERY CO.
Milwaukee, Wisconsin

Bargain Prices
100,000 Lbs. Capacity
ALL STEEL ORE HOPPER DUMP CARS
MCB condition. Ready for service.
Cheap freight to any part U. S. A.
DULUTH IRON & METAL COMPANY
Duluth, Minn.

12-ton Vulcan Gasoline Locomotive, Class EW-12-4 speed worm gear drive.
8-ton Whitcomb Gasoline Locomotive.
4-ton Whitcomb Gasoline Locomotive.
45—Koppel 2-yd. 2-way All Steel Cars, Catalog 1183.
All above equipment is 36-in. gauge; purchased new last year; used only on one job.

ARTHUR S. PARTRIDGE
417 Pine Street St. Louis, Mo.

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¾ cu. yd. American Steam Shovel. Full revolving on wheels. Ready to operate. Only $2500. Part time payments.

BROWNLEE PARK GRAVEL CO.
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FOR SALE

New and used Rotary Dryers. Write us your requirements.

McDERMOTT BROS. CO.
Allentown, Penna.

FOR SALE

1—75 H.P. Electric Stripping Outfit.
1—Gas Portable Core Drill.
1—No. 3 Gates Gyratory Crusher with Screens.
1—No. 9-K Gates Gyratory Crusher.
2—No. 8-D Gates Gyratory Crushers.
1—No. 5 Telsmith Gyratory Crusher.
1—No. 7 Williams Fine Grinder.
1—No. 7½-D Gates Gyratory Crusher.
1—18"x36" Farrell Jaw Crusher.
1—36"x48" Traylor Bull Dog Crusher.
1—No. 6 Austin Gyratory Crusher.
2—No. 5-K Gates Crushers.
1—Complete 400 Yard Gravel Plant.
1—Complete Small Stucco Plant.
1—6'x22" Hardinge Conical Ball Mill.
1—41-ton Baldwin Standard Gauge Locomotive.
2—Complete ¾-yd. Gas Cableway Outfits; 1 steam.
1—Sauerman 1-yd. Outfit, without power.
1—Sauerman 2-yd. Electric Outfit, complete.
1—New 200 H.P. G. E. Motor.
1—65' Center Bucket Elevator.
50—Steam and Electric Channelers.
1—33" Fuller Mill.
1—3'x30' Indirect Fired Dryer.
1—42" Gas Whitcomb Locomotive.
1—150' Matthew Gravity Conveyor.

Send us your inquiries and we will send you our offerings from our $15,000,000 Listing.

National Equipment Company
Bloomington, Indiana

32 ton, American, 32-in. wheel centers, 175 lbs. pressure, air and steam brakes; completely overhauled.

75 ton, 21x26-in., 6-wheel switcher, piston valve, Walschaert valve gear, superheated; built Dec., 1922.
50 ton, saddle tank, new boiler, new cylinders, new tank, new tires.
17—16-yd. Western dump cars, rebuilt; new bodies, steel lined floors.
10—20-yd. Western dump cars, all steel, vertical air cylinders.

HAVE FORTY LOCOMOTIVES, OVERHAULED AND READY, 5 TO 100 TONS, CARS, SHOVELS, CRANES, RAIL, ETC.

ALSO
LOCOMOTIVE SPRINGS, MANUFACTURED AT OUR WORKS HERE

SOUTHERN IRON & EQUIPMENT COMPANY
(Est. 1889)
ATLANTA - - - - - GEORGIA

Crushers No. 12, 10, 9, 8, 7, 6, 5, 4
Roll Crushers
84x72, 36x60, 72x30, 18x30
60x84—Jaw Crushers—16x60
36x48—40x42—26x50—24x36—20x34—60x84
12x37—18x36—13x30—7x24—7x16—10x22
2—30 and 37 Kennedy Gearless Crushers.
DISC CRUSHERS, 48", 36", 24", 18"
3 Oil Engines 200 H. P., New
¾—1 AND 1¼—2½-YD. CAT SHOVELS
5 Ton Crane 70' Span A C Motors
AIR COMP.—HOISTS—KILNS
DRAG LINES—LOCO. CRANES—MOTORS

Ross Power Equipment Co.
13 South Meridian St. Indianapolis, Ind.

RAILS New and Relay
ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES

S. W. LINDHEIMER
38 S. Dearborn St. Chicago, Ill.

In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg. New York City **M. K. FRANK** **Union Trust Bldg. Pittsburgh, Pa.**

STORAGE BINS

Capacity from 50 to 300 tons. All steel construction. Either circular or rectangular.

F. WILLIAM STOCKER
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Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT WANTED

WANTED

1—Good second-hand No. 6 Gyratory Crusher.
1—Good second-hand dryer, 10 tons per hour capacity.
1—Type G Kent Maxecon Mill, must be in good condition.

Quote us lowest Cash Price and point of shipment.

Box 145, care of Rock Products
542 So. Dearborn St. Chicago, Ill.

MAKE YOUR WANTS KNOWN

ROCK PRODUCTS is the business journal of the rock products industry; its readers are men of influence, and their buying power is big. An advertisement in this classified department will be seen and read. Make your wants known and see how quickly they will be satisfied.

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Crushing, Grinding and Drying Plant for Sale

Ideally located on one-acre site in industrial district of Los Angeles, California, now attracting big new industries. Buildings all first-class, including office, power house and plant—spur track on two railroads.

Equipment in good condition includes 140 h.p. gas engine with belt driven generator for developing plant power, motors, gyratory crusher, Raymond pulverizer, mixer, Ruggles-Cole and plain type rotary driers, elevators and bins.

Western S. C. P. Company
1016 W. 9th St. Los Angeles, Calif.

GYPSUM

Mining, Quarrying, Processing, Construction, and Research

The undersigned is available for consultation and service to the Gypsum Products Industry in connection with all problems relating to the production and use of gypsum plaster, stucco, wallboard, tile, etc. I have facilities for testing and research work, and a background of successful experience as a chemist and superintendent of gypsum plants.

Walter B. Lenhart
265 Quincy Ave., Long Beach, Cal.

OPPORTUNITY

In Middle West, for man whose personality and previous experience in sales and hydraulic production of gravel fit him to manage a business with unusual future. Investment possible, but not required. Also have opening for plant superintendent or foreman experienced in pumping operations.

Address Box 142, care of Rock Products
542 South Dearborn St. Chicago, Illinois

BUSINESS OPPORTUNITIES

FOR SALE

Two deposits of limestone in northwest Florida—both large tonnage and high grade. Railroad runs through one and no great distance from other. Should interest cement manufacturers. Address

S. D. CRENSHAW
P. O. Box 667 Richmond, Va.

FOR SALE

Rock crusher and sand washing plant. Capacity 300 yds. per day. Only one in city of 40,000 population. Sales average 7000 cu. yds. per month.

TUCSON ROCK & SAND CO.
P. O. Box 265 Tucson, Ariz.

POSITIONS VACANT

QUARRY SUPERINTENDENT—A NATIONally known gypsum company wants an experienced superintendent for one of its quarries in the middle west. He must be thoroughly experienced in all phases of quarrying and dirt moving. He should be 33 to 40 years, married; at least high school graduate, of forceful personality, and a good handler of men. Replies will list completely address, phone, age, experience, education and reference. Address Box 144, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

AN ESTABLISHED MANUFACTURER wants a sales engineer who can get results. Must have a thorough knowledge of drying, grinding and pulverizing in the field of nonmetallic minerals. Send full particulars of selling experience and technical training. Communications confidential. Address Box 137, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

SUPERINTENDENT WANTED FOR LIMEstone Quarry. Plant 2000 tons per day capacity. Electric operation. Diesel engine shovel. Give full particulars of experience, when available and salary expected to Box 138, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

POSITIONS WANTED

Executive-Manager

A mechanical and sales engineer, with an unusually broad engineering, manufacturing and business experience with executive ability, desires a connection that will lead to an interest in a growing business.

Thoroughly familiar, trained and experienced in design, shop practice, modern manufacturing methods, costs, plant management, sales and business administration. Have successfully handled men from foreign laborers to trained engineers.

At present industrial engineer and sales executive AAAA1 corporation, technical graduate; age 35 and married. Capable of producing results. Best of references.

Box 143, care of Rock Products
542 So. Dearborn St. Chicago, Ill.

SUPERINTENDENT—15 YEARS EXPERIence in charge of limestone mines, quarries and lime burning plants. Executive ability and experienced in plant design and construction, mine and quarry development. Address Box 112, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

POSITIONS WANTED

GRADUATE MINING ENGINEER—NINE years nonmetallic mining experience, engineer to superintendent. Thoroughly familiar with the gypsum industry. Desire connection with company that will recognize executive and managerial abilities and one that offers a bright future. Very adept at handling men. Energetic hustler that can get results and assure lower costs. Address Box 136, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

SUPERINTENDENT—YOUNG MAN WITH thirteen years' experience in charge of quarry and crushing operations in limestone and trap rock. Considerable experience in plant construction. Can produce results. Willing to start for moderate salary. Excellent references. Address Box 134, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

SUPERINTENDENT WANTS CONNECTION, twenty years' practical experience, construction, and operation of crushed stone and gravel plants, thorough knowledge of drilling, blasting, shovel operations, transportation, conveying, and milling operations, location anywhere; excellent references. Address Box 139, care of Rock Products, 542 South Dearborn Street., Chicago, Ill.

SUPERINTENDENT—20 YEARS' EXPERIence in mill and quarrying operations. Familiar with both steam and electric shovels and heavy drilling and blasting operations. At present employed. Can furnish complete record for whole period with best of references. Address Box 135, care of Rock Products, 542 South Dearborn Street, Chicago, Illinois.

SUPERINTENDENT—DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

EXPERIENCED CEMENT PLANT SUPERINtendent desires to make new connection. Has excellent record and best references. Address Box 141, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

Employers seeking good help can secure it by inserting an advertisement in this department.

THESE columns offer you the best medium in the rock products industry for the sale, exchange and purchase of used equipment, rock, quarry and gravel-pit property; the circulation and buying influence of Rock Products extends beyond those now actually engaged in operating plants; it includes mining engineers and capitalists who may be reached through no other medium, because of Rock Products' world-wide reputation as the *business journal* of the rock products industry.

INDEX TO ADVERTISEMENTS